The American Journal of Pharmaceutical .... Education ....

THE OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

"It is not believed that an educational program, intended as a preparation for life's work, can be made attractive to youngsters as articles of commerce are sold. Courses in education, leading to preparation for a life's work, must be chosen on the basis of likes and dislikes."—R. A. Kuever.

Volume IX *July, 1945* *Number 3*

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President Jenkins Makes a Request

The regulations of the Office of Defense Transportation make it doubtful that we will have a full regular annual meeting of the Association this year. However, it is certain that we will have at least a meeting of the Executive Committee, and probably a meeting with a representative from each school. In any event the reports from the various committees will be due for presentation. May I suggest that it is more important than usual for the committees to start their work by correspondence since few of the committees will be able to meet and discuss their problems this year. Some of the committees have already made excellent progress.

I request that each committee chairman append to his report a copy of all recommendations written in resolution form. These appended resolutions can then be referred to the Committee on Resolutions, greatly expediting their work and insuring that all matters recommended by a committee receive consideration.

As you know, the success of our annual meetings depends on the work of the committees. I trust that you will do everything possible to make your committee's work outstanding.

Purdue University
May 21, 1945

Glenn L. Jenkins, President

In compliance with certain regulations issued by the War Committee on Conventions of the Office of Defense Transportation, your Executive Committee has voted *not* to hold an annual meeting this year. I am sure that you will regret the necessity of this action, as all of your officers do, because the problems confronting pharmaceutical education seem to be greater than ever before.

It is planned that the Executive Committee will meet early in September to transact such business as may be necessary in the interim between meetings as provided by the Constitution. Each officer and committee chairman should submit a report with any recommendations for consideration by the Executive Committee and subsequent publication in the American Journal of Pharmaceutical Education. These reports should be forwarded to Secretary Eidsmoe so that he will receive them not later than September 1, 1945. It is requested that all recommendations contained in committee reports be written in the form of resolutions and that a copy of them be appended on a separate page to each report.

Officers of the Teachers Conferences are also requested to solicit papers on pertinent educational topics. These should be collected by the secretaries of the respective conferences and forwarded to Secretary Eidsmoe so that he will receive them before September 1, 1945. It is important that such papers be submitted so that they may be considered for publication in the American Journal of Pharmaceutical Education.

The difficult conditions under which the Association must conduct its business this year emphasize the need for diligence and careful work on the part of each officer and committee. We invite the submission by each member school of problems that should be considered by the Executive Committee at its September meeting.

Purdue University
June 14, 1945

Glenn L. Jenkins, President

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The Beginnings of Physiology*

ARNO B. LUCKHARDT

Department of Physiology, University of Chicago

Introductory

Animal physiology deals with the study of the function of the various bodily structures (organs and tissues) and their interdependence. It must be perfectly obvious that a study of function presupposes a more or less detailed knowledge of structure. Without such knowledge of structure furnished by the science of anatomy, physiology as a science cannot be said to exist. From the earliest times, to be sure, investigators attempted to elucidate the function of this or that more or less accessible part of the mammalian body by tampering with it experimentally. If this be considered physiological experimentation we have had it very early in human history. Real advance on a broad front came however, when anatomists, restricted as they often were in their studies by opportunity, law, or prejudices, described in detail the gross aspects of the machine constituting our body. As you heard in a previous lecture their anatomical studies culminated in the prodigiously important work of Vesalius (1543). With the appearance of this descriptive and illustrated anatomy, 'anatomia animata', as physiology was first called, could develop along truly scientific lines.

It is not entirely fortuitous that physiological investigations were directed early along two lines of mammalian phenomena which intrigued laymen and physicians alike, investigations which turned out to be of the most fundamental character for further study of other living processes and organ activity, namely, studies of the *circulation* and the *respiration*. The rhythmic and tumultuous activity of the mammalian heart and the rhythmic respiratory movements were obviously associated with body warmth—even with life itself. The vari-

*Sometime ago the scientific staff of the University of Chicago gave a comprehensive series of lectures on the history of science. Dr. Luckhardt was appointed to give three lectures of 50 minutes each on the history of physiology. The lectures were written for an intelligent lay audience and were highly illustrated with lantern slides and books. Since these illustrations cannot be incorporated in the text, the notes about them have not been printed. The editor obtained permission to publish these lectures in the *Journal* because he believes they will be a real contribution to the teaching of the history of this basic science. The third lecture was printed in the *Quarterly of Phi Beta Phi* in January 1935 and permission for republication has been granted by that *journal*. The other two lectures have not been printed previously.—Editor.

ations in the cardiac activity as evidenced by changes in the pulse rate during disease was observed by physicians as early as the 17th century before Christ (Edwin Smith Papyrus). The doctor, and the observing layman could not fail to notice the change of character and rate of the respiration in individuals beset by fever. Little wonder, then, that cardiac phenomena *particularly* received early attention and early elucidation once the stage was properly set by anatomy. The explanation for the why and wherefore of respiration came a little later with the development of chemistry and the isolation of the various gases in inspired and expired air.

It is my purpose to outline to you more or less synoptically during the remainder of the hour the rise of our knowledge of cardiac function and the associated function of external and internal respiration.

I. *Cardiac Function—Discovery of the Circulation of the Blood*

1. Early Conceptions.—Long before Vesalius, physicians were familiar with the general structure of the heart, with the blood vessels attached to it, and with such viscera as the liver and the gastero-intestinal tract. It was furthermore known that certain of the vessels contained blood and that this blood experienced a certain kind of restricted *movement*. Before describing to you the beliefs of the ancients concerning the function of the heart and the various blood vessels connected therewith, allow me to review before this mixed audience the anatomy of the various parts concerned in this discussion as known to the Greeks and Romans of the early Christian era. From the hollow muscular heart with its four chambers arise four large vessels, two from the left side of the heart and two from its right side. From the left ventricle arises the aorta or arteria magna; from the left auricle the arteria venosa now known as the pulmonary vein. It is obvious from the diagram that branches of the aorta pass to all parts of the body and that the pulmonary vein comes from the lungs. On the right side of the heart we see the pulmonary artery passing to the lungs. We also see *in diagram* the portal vein coming from the gastrointestinal area to pass into the liver. The blood coming from the liver passes into the vena cava which is seen extending downwards to the extremities

and upwards into and past the right auricle to the head. In the diagram the wall between the right and left ventricle is shown *perforated* as believed by most physicians well into the 17th century. Except for these perforations in the interventricular walls, the anatomical relations are correct but represented highly diagramatically in this slide.

In 1917 I purchased this book (*Physiologia Peripetetica*, by Magirus, 1596). In it there occurs, among other things, a discussion in Latin of the movements of the blood as believed by scientists and physicians up to that time (1619). Having made a literal translation of various sections dealing with the heart and adnexæ, I propose to read the text whilst you follow the description on the diagram before you; for I thought from many points of view that a reading of some of the passages would be more instructive than a mere recital of the conceptions held by the scientific world from the time of Galen (200) to 1619 and later—some 1400 years!

Quote: "The heart is the principal part of the middle of the belly consisting of hard, dense and solid flesh by an interweaving of a triple set of fibres. It has a pyramidal shape not dissimilar to a pine cone and is the abode of the vital faculty. ***** Its tip is pointed to the left side.

The heart is the beginning of life, the fountain of heat and the life giving nectar, root and spring of the arteries, prime author of the respiration. **** By its perpetual motion and continuous heat it begets the *vital spirits*. For when it is dilated (which motion is called diastole) it attracts by means of its straight fibres blood from the vena cava into its sinus, as well as air from the lungs through the venous artery; when, on the other hand, it contracts (called systole) through the transverse fibres it expels from itself the material which it has previously received: namely, it expels blood from the right ventricle into the lungs which are nourished by the arterious vein, and vital spirits from the left chamber through the aorta to the entire body.

Though single in all animals it has a right and left part, separated from one another, known as cavities, sinuses or ventricles. Between the right and left ventricle is a partition which helps distinguish the one from the other. Since the partition is really coarse and firm it was incorrectly called by Aristotle, the third ventricle or third sinus. Even if no holes

can be seen passing through this septum, nevertheless, the blood exudes into the other ventricle through most narrow pores. The right ventricle has the shape of a growing moon, is much greater than the left and receives the blood flowing into it from the vena cava, prepares and makes it more perfect, and distributes it partly to the lung for its nutrition partly into the left ventricle through openings scarcely visible, as becomes material for vital spirits. The left ventricle has the form of a cone and is higher. It has more substance, contains vital spirits made from the purest blood and distributes the latter throughout the entire body together with air just received from the lung through the venous artery. ***** " Again, "Between both ventricles is a wall commonly called a median septum which on first sight appears solid but on more careful inspection is riddled with many foramina so that there might be a free communication from the right to the left ventricle in spite of what the neoterics say against Galen."

" ***** It, (the liver), is situated below the diaphragm in the right hypochrondrium and is the chief workshop of the blood. Its exterior is called Gibba, i. e., convex and it is smooth. Its interior is named Concava and is rough. ***** Since it arises from blood [about the 6th day following conception] it possesses the power of forming blood. By a natural propensity or specific virtue it changes the chyle, which it receives, into blood and so makes chyle red similar to itself. ***** From the earthy material it produces black bile (melancholia), from the crude and cooler portion, mucus, and only from the more moderate and aerial portion does it produce true blood. As instruments for the performance of these functions it makes use of the natural and the vital spirits brought to it from the heart through the small arteries." In the "Gibba" ***** "chylosis is effected, which is the conversion of the chyle, after the separation of the excrementitious matter into the mass suitable for nutrition, namely, the blood. In the "Sima or Cava ***** the part of the liver which covers the stomach ***** is effected 'hematosis', which is the alteration of the chyle into a fluid succulent liquor. In the middle portion of the liver where branches of the portal meet with branches of the vena cava there is effected 'diacrisis', that is, a separation of the useful from the excrementitious". Concerning the blood Magirus writes: "The Blood is a warm, temperate, sweet, ruddy humor, prepared in the mesaraic

veins [i. e., intestinal veins] and made together in the liver from the more stable, richer, and yellowish parts of the chyle. ***** It is sweet because it arises by moderate heat from the most temperate and best parts of the chyle. Its ruddy color it has from the liver which is red. ***** Such men as Empedocles and Critias affirm the blood to be the soul (anima). Cleathes, however, as well as Chrysippus and Zeno say that the soul is *nourished* by the blood." ***** The *natural spirits* are subtile, procreated in the liver from the purer blood, whence it is diffused through the veins throughout the entire body for the performance of all natural actions. ***** By this *(natural) spirit* and under its direction, the gross blood is carried to the most distant parts. First of all it is a vehicle of the aliment; for the humors born in the liver, both because of their coarseness and slowness of motion on account of which they can scarcely pass of their own account through the narrow openings, pass unwillingly to the remainder of the body. Then this (natural) spirit of the liver bestows the natural faculty on the various parts by virtue of which all parts of the body attract, *retain, and concoct their particular aliment.* Owing to its force and impetus also they expel from themselves excrements.

Again: "The matter of which [the vital spirit] is made is the natural spirit, procreated by the liver, which then is brought through the vena cava together with arterious blood and is brought upwards most pure and enters the right ventricle of the heart. Where having been most completely attenuated, it enters the left ventricle through openings not exceedingly hidden if you examine the palpitating heart of a dissected dog. Here, however, it is not only tempered by the inspired air but also receives fuel and increment prepared in the lungs. ***** It forms a rarification of itself not unlike most subtile flames. ***** The Aorta is a large artery which leads the vital spirits to all parts of the body. ***** "if this spirit would be prevented from acting the animal would immediately perish. ***** "The arteria venosa arises from the left ventricle of the heart and is continued into the lungs from which it brings the air for the sake of cooling the heart. ***** As for the Veins: "The Vena Cava, also called the *Great*, comes from the convexity of the liver, runs out throughout the entire length of the animal and carries blood or nourishment to all parts."

2. Wm. Harvey and the Discovery of the Circulation of the Blood.—Such was the scientific status concerning the functions of the heart, blood vessels and liver when a young and bellicose Englishman, Wm. Harvey, decided to prosecute anatomical studies at the University of Padua. He arrived at the University in 1598 and remained for five years (1603). Nowhere was anti-Galenic feeling more rampant. One of his most gifted teachers was Fabricius of Aquapendente (1537-1619) who, having discovered that all tributary veins to the vena cava possessed valves interpreted the facts in true Galenic fashion by stating that the valves, cupped towards the heart, prevented an excessive amount of blood from reaching the lower extremities to the exclusion of the upper extremities. The explanation offered did not appeal to Harvey. On his return to England he not only *thought* about the function of the heart, veins and valves, but applied the inductive method in actual experimentation on *living animals*.

Galen had found blood in arteries during life but not in death. Harvey tying off an artery in a living animal and nicking the vessel proximal to the ligature saw blood, not air, issue from it at each heart beat. As time went on, less and less blood spurted forth and finally none at all. Surely the liver could manufacture sufficient amount of blood to replace that lost! And furthermore, it was blood that issued and not the theoretical vital spirits with air; for as an artery, it was to deliver air, that being the reason that it was, and is still called air tube or artery. When the experiment was repeated except that the nick in the artery was made distal to the ligature only a small amount of blood issued, never air. Instead of making generalizations at his desk in advance of ascertainable facts, he continued to *experiment*. He constricted the arm and noticed that small nodules, in rosary bead fashion, appeared at each of the vales, distal to the ligature or constriction. On milking with his fingers the vein towards the heart, the distended vein became momentarily bloodless but rapidly became turgid with blood from a point *below* the constriction. According to the Galenic view the vein should have become turgid above and not below the constriction. (Explain the slide.) From his experiments it did appear that blood *flowed*, not down the vena cava and from the heart, but towards the heart in the veins and definitely away from the heart in the

arteries. Considering the fact that an animal was rendered so promptly bloodless by bleeding from the arteries, was it not possible that the entire blood moved "as it were, in a circle" by leaving the heart in the arteries and then returning to it by the veins?

Having measured the amount ejected by the heart at each contraction he writes: "In the same way, in the sheep or dog, say that but a single scruple of blood passes with each stroke of the heart, in one half hour we should have 1000 scruples, or about 3 lbs. and a half of blood injected into the aorta; but the body of neither animal contains four pounds of blood, a fact which I have myself ascertained in the case of the sheep."

Using an argument of Galen to suit his purpose the while referring to him as that "great man, that Father of Physic," Harvey shows that the blood must pass through the lungs in order to move in a circular manner. In a later chapter, however, he observed that if the vena cava is seized with fingers or forceps "you will perceive the part that intervenes between the fingers and heart almost immediately becomes empty, the blood being exhausted by the action of the heart." As a result the heart becomes paler in color. "If the contrary, the artery, namely the aorta, instead of the vein be compressed or tied, you will observe the part between the obstacle and the heart, and the heart itself, to become inordinately distended, to assume a deep purple or even livid color, and at length to be so much oppressed with blood that you will believe it about to be choked." There is but one interpretation for these facts, namely, that the blood passes from veins *to* the right heart, to the lungs, from the lungs to the left ventricle, and thence to the aorta.

In this manner did Harvey by induction and *experiment* establish to his own satisfaction and to many of his friends that blood is continuously in the process of circulation. Had Harvey not listened to, as he says, the "requests, I might say entreaties of many," the world's greatest medical classic, a modest text of 72 pages might probably never have been published.

A moment ago I rather intimated that Harvey's "discovery" of the passage of blood from the right ventricle to the left one, via the lungs, was chiefly based on argumentative grounds. Medical historians are rather inclined to attribute

this discovery to Michael Servetus, who at an earlier date (1553), described his discovery of the pulmonary circulation in these words: "The vital spirit has, therefore, its source in the left ventricle of the heart, the lungs aiding most essentially in its production. It is a fine attenuated spirit, of a crimson color and fiery potency, for it is engendered, as said, by the mingling of the inspired air with the more subtle portion of the blood which the right ventricle of the heart communicates to the left. This communication, however, does not take place through the septum, partition, or midwall of the heart, as commonly believed, *but by another admirable contrivance, the blood being transmitted through the lungs, in the course of which it is elaborated and becomes of crimson color.* Mingled with the inspired air in its passage, and freed from fuliginous vapours by the act of expiration, the blood becomes the fit dwelling place of the vital spirit; it is finally attracted by the diastole, and reaches the left ventricle of the heart. ***** It is not simply air, but air mingled with blood that is returned from the lungs to the heart by the pulmonary vein. ***** It is in the lungs consequently, that the mixture (of the inspired air with the blood) takes place, and it is in the lungs also, not in the heart, that the crimson color of the blood is acquired." This record of a pulmonary circulation was published in a *theological work, "Restitutio Christianisimi,"* which caused the fanatical Calvin to have Servetus burned alive at the stake with his books. The medical (physiological) passages in the book were not discovered until 1694—66 years after the publication of Harvey's immortal treatise.

The time is too short to consider *at length* the other claimants for the honor of having discovered the circulation of the blood. One, Realdus Columbus, was professor of anatomy at Padua from 1542-1546. Servetus and Andreas Cæsalpinus were both students at Padua. It is contended that Cæsalpinus' works which contained his theory of the circulation of the blood were all published the year that Harvey left Padua and that he must have heard the bitter criticisms directed against his professor of medicine, Radio, who in a book, evaluated the circulatory doctrines of Cæsalpinus and Columbus. We might best close this controversial chapter with the words of C. Volini who wrote: "If a discovery is the act of finding out and bringing to public notice something unknown before, I cannot agree that to Harvey belongs the credit [I would say

the 'entire credit'] of the discovery of the circulation of the blood. Nevertheless, I recognize that Harvey's small book ***** is unmistakably the masterpiece of a man of genius. His many and original experiments on this subject and his coordinate arrangement of all knowledge pertaining to the circulation of the blood, are the real pillars to his glory."*

3. **Capillary Circulation.**—Whereas Harvey had amply proved that blood circulates, he had no notion how the smaller arteries connected with the equally small venules. The general notion of the time, which Harvey probably also shared, was to the effect that the blood in the smaller arteries emptied their blood into ill defined spaces much as a well defined creek pours its water into a swamp whence it again leaves as a rivulet, the venule. For the elucidation of this problem a study of tissues and organs was necessary under a magnification greater than was available at the time; for Harvey and the scientific colleagues of his time possessed only low power magnifying glasses. The earliest microscopes (1590 on) known at the time and in no jocular sense as "flea boxes" (for perhaps obvious reasons) consisted of a single glass bead with a highly convex surface suitably placed at one end of a tube of adjustable length to the other end of which was attached a glass plate to which the object of regard was fastened. From this microscopion, flea box, or "Guckbüchslein", as the Germans were wont to call it, there gradually evolved the modern microscope. Beginning as toys, scientific men promptly trained them on all sorts of objects. With the one shown in the next slide, Robert Hooke in 1665, among other things, studied the texture of cork as "Observation XVIII. Of the Schematisme or Texture of Cork, and of the *Cells* and Pores of some other such frothy Bodies." This is the first description of the fundamental anatomical and physiological unit of animal and vegetable tissues. You will please note that the word "cell" coined by him for this unit has been retained to this day. His book with illustrations can be examined at the close of the period.

But there were others besides Hooke and more important to us in this present study who used the microscope to advantage in unraveling the problem of the circulation and the respiration. The three of greatest importance were Marcello Malpighi, Antoni van Leeuwenhoeck, and Jan Swammerdam.

*C. Volini: Andreas Cæsalpinus: An Answer, J. A. M. A., Vol. 73, No. 2, July 12, 1919, p. 132.

Marcello Malpighi (1628-1694), with an impetuous zeal, studied the microscopic structure of the tissues of the body. Whilst studying the lungs of a frog he noted a plexus of minute blood vessels around the small air sacs of which this organ is constructed. Malpighi saw the smaller arteries break up in finer and finer vessels which he called capillaries. As he followed these capillaries under the microscope he noticed them get larger and larger and so end ultimately in beginnings of the veins. According to these findings the blood of the arteries passed along well defined channels and did not stagnate, so to speak, in a morass or swampy region composed of cells of the various tissues. The following slide taken from his work was designed to illustrate the capillary bed.

It would seem, however, that Malpighi did not fully recognize the importance of his discovery. At any rate, most historians are inclined to attribute to Antoni Leeuwenhoeck (1632-1723) the honor of properly interpreting the importance of his discovery of the capillary bed made a little later but independently of Malpighi. Leeuwenhoeck examined all types of objects in the mineral, animal and vegetable kingdom. Himself an expert lens grinder he constructed for himself no less than 247 microscopes with a magnification of from 40-270 diameters—possibly higher. The following figures shows their general construction and particular use in the study of the circulation of the blood in the more or less transparent tail of a fish. With this setup as illustrated he observed (1686), shortly after Malpighi, that the connection between arteries and veins consists of delicate capillaries depicted in the following slide. He writes:

"A sight presented itself more delightful than any mine eyes had ever beheld; for here I discovered more than 50 circulations of the blood in different places, while the animal lay quiet in the water, and I could bring it before my microscope to my wish. For I saw not only that in many places the blood was conveyed through exceedingly minute vessels, from the middle of the tail towards the edges, but that each of the vessels had a curve or turning, and carried the blood back toward the middle of the tail, in order to be again conveyed to the heart. And thus it appears that an artery and a vein are one and the same vessel prolonged or extended."

The final link of evidence in support of the theory of the

circulation of the blood was furnished by Leeuwenhoeck peering *intelligently* through a microscope at the circulatory system in the tail of a *fish*.

4. **Red Blood Corpuscles.**—The first to observe the red blood corpuscles was Jan Swammerdam (1637-80). Publication of this description did not take place until 57 years later. In the meantime they were rediscovered by Malpighi who observed them in the blood vessels of the intestine but interpreted them to be globules of fat. More to the point were the descriptions of Leeuwenhoeck who studied them in a variety of animals (birds, frogs, fish and a number of mammals including man). As we will presently see, these corpuscles, red in the higher animals because of the iron containing compound, hemoglobin, are of extreme significance in respiration, a subject to which we now turn in the closing minutes of this hour.

II. *Respiration*

The prime necessity of breathing air was of course observed by Hippocrates (460-377 B. C.), who wrote: "Man and Animal require three kinds of nourishment: Food, drink, but above all, Pneuma, known as Φυσαὶ, outside the body, within it is ἀερ. For days one can live without food or drink; with pneuma no one can live. ***** For it (pneuma) nourishes the fire; without it fire cannot exist." Leonardo da Vinci (1500) was even more specific: "No animal can live in an atmosphere where a flame does not burn." Even at the present day we still speak of the "breath of life" in recollection of the ancient beliefs concerning the importance of inspired and expired air to human existence.

The general importance of external respiration was soon to be unravelled by the "Invisible College" at Oxford, the founders of the Royal Society of London (1662). The prime mover in this group of young scientists was the stammering Robert Boyle. He showed (1662) that the lighted candle as well as the life of a mouse was snuffed out simultaneously when the air in which both were placed was exhausted by the newly devised vacuum pump. Presumably the air had by the exhaustion pump lost "its elastic spring." Boyle's assistant, Robert Hooke (previously mentioned), demonstrated to the "College" another experiment which at a stroke disposed of the old Galenical notion that the heaving movements of external respira-

tion were necessary for the movements of the blood, and, indeed, for life itself. Having opened widely the chest of a dog, and having perforated the lungs at several places whilst maintaining the lungs in a constant state of inflation by means of bellows inserted into the trachea, he showed that the animals could be kept alive indefinitely by the constant stream of air passing down the trachea to the lungs and escaping through the incisions made in their tissue. A *constant flow of fresh air* through the lungs and not the movements of the lungs themselves seemed of paramount importance in the preservation of life (1667). A few years later, Lower, also a member of the "invisible college" that presumably fostered the black arts, noting the difference in color between the blood coming to and leaving the lungs, concluded that "the blood imbibes the air as it passes through the lungs and that its red color is entirely due to this admixture."

A greatly neglected genius was John Mayow (1643-79), who performed and published experiments of the most interesting nature which unfortunately were soon forgotten. He noticed that there occurred a diminution of the volume of the gas contained in an inverted bell jar during the ultimate extinction of the flame of the candle. He furthermore observed that after the candle ceased burning within the bell jar he was unable to ignite powder placed therein by means of a burning glass. He next showed that if he placed a mouse in the bell jar under conditions analogous to the candle a diminution of the gas about the mouse ensued just as in the case of the lighted candle. Not only that! The gases left behind in the chamber on the decease of the mouse would no longer support the combustion of the lighted candle. From these experiments it was clear that similar to the burning candle the mouse's breathing *abstracted* something vital from the surrounding gases. What it *was* that was abstracted or removed in both instances was not known, since the chemistry of gaseous air was not as yet discovered.

In 1757, James Black discovered "fixed air," namely, CO_2. He furthermore showed that the substance was given off in the expired air of animals including man; for expired air blown through lime water caused a precipitation of chalk ($CaCO_3$). Although Joseph Priestley (1733-1804) soon after discovered oxygen gas he really did not appreciate the importance of his

discovery. In this connection it is fair to state, however, that he recognized *by experiments* [*and not intuition*] that this gas (oxygen) is used up in fire as well as in breathing. It remained for Lavoisier (1743-94) to clarify the situation. Isolating oxygen gas independently of Priestly and giving it its name, he showed by animal experimentation that during respiration, O_2 is removed by the lungs from the inspired air and that CO_2 appears in the expired gases. It was his conception that the oxygen of the air combined with carbon atoms in the lungs. As all scientists of the time agreed that such a union of C with O in the lungs would generate more heat than the lung tissue would bear, Lagrange (1791) proposed that the lungs absorbed the oxygen of the inspired air and conveyed it into the blood pouring continually through them and that in the course of the circulation the O_2 combined with carbonaceous material, thus warming the body with the formation of CO_2—the latter returning to the lungs via the venous blood to be excreted there in the expired air.

In a posthumous work Spallanzani (1729-1799) in 1803 demonstrated that oxygen is consumed by the tissues and that it is in them that the CO_2 is formed; for he found that bits of tissue consume O_2 and in so doing give off CO_2.

By the use of the mercurial air pump, Magnus was able (in 1837) to extract more CO_2 from venous than from arterial blood, and that arterial blood yielded him more oxygen. When Lothar Meyer showed, in 1857, that the amount of oxygen liberated by extraction with the mercurial pump does *not* conform to the law of Dalton, scientists began to conceive of other possible mechanisms for the wholesale transfer of O_2 to the tissues besides the simple transfer of this gas by solution in the liquid portion of the blood. Hoppe-Seyler (1862) attributed to the pigmented iron bearing compound of the red blood corpuscles, hemoglobin, the property to combine rapidly with vast amounts—figuratively speaking—of oxygen. The important property of the red corpuscles, because of this hemoglobin, to act as transfer agent of an ample supply of oxygen to the tissues was established. The significance of the red blood corpuscles described in an *academic* fashion by Swammerdam and Leeuwenhoeck was now obvious. President Conant of Harvard was until recently working on the marvelous properties of this pigment, hemoglobin. Let us hope that he

will, in spite of the interference of administrative duties, give us the final solution. [I doubt that the most recently proposed return to a mediæval Lullian philosophy and metaphysics, at the desk, will give the unequivocal answer.]

Let me hurry to a conclusion. It must appear to all of you that an elucidation of the physiology of the circulatory and respiratory systems by *tedious experiments of thinking experimentalists* was essential to a proper understanding of the function, or malfunction, of all of the other viscera of the body. Let us hope that a further understanding of these subjects, and others, will be allowed to proceed by a similar line of approach without interruption.

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Digestion

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Introductory

From the earliest times it was clear to every layman that food and drink were absolutely necessary for individual existence. It was also obvious that the food and drink taken into the alimentary tract experienced profound changes there-

in; for the residues of the food (and the drink) were discharged by the emunctories in quite a different form from what they were in when ingested. It was, perhaps, a self evident fact to the early dissectors of man and beast that the gastrointestinal tract, so-called, prepared the aliment for proper absorption. It matters not for the moment whether the whitish semi-liquid material in the intestinal tract of an animal in the process of digestion is called *chyme* or *chyle*. It is of moment, however, that the early observers (Aselli, Pecquet, Rudbeck) in the days immediately following the publication of Harvey's book on the circulation discovered (if you please) the *lacteals* coming from the intestines and the *thoracic duct* into which the lacteals poured their contents. It was of *paramount* importance to them that these lacteals coming from the small intestine poured their contents via the thoracic duct into the venous system. Since this fluid in the thoracic duct and lacteals had much the same appearance as the whitish semi-liquid fluid found inside the small intestines of an animal during digestion of a meal, it seemed plain to *them* that in some way the material in the gut which we now call *chyme* was transferred to the lacteals as chyle without the undigestible matter about it. After the discovery of the circulation of the blood it was believed that intestinal chyme was absorbed directly into the rootlets of the portal vein for distribution throughout the body by the circulation; with the discovery of the lacteals *that* possible route for absorption was discarded and everyone now believed that digested material was taken up solely from the gut by the lacteals. This view was held, I know, as late as 1824 by one prominent physiologist, Legallois, and for all I know a good deal longer. About that time, Magendie showed that some absorption could take place by the venous route. *The processes occurring in the digestive apparatus which reduce ingested food material, or much of it, to a state capable of being absorbed by the rootlets of the veins or the rootlets of the lacteals coming from the intestines, comprise the phenomena of digestion.* In the ensuing hour I propose to recount to you chronologically the rise of our knowledge of these phenomena. In the *interest* of such non-medical students and other non-professional laymen, who may be present, and with the indulgence of the sophisticated, I show you at the start the general *scheme* of the digestive tract with the chief glands opening into it.

Perhaps I have committed a grave pedagogic error by enlightening some of you by pointing out the chief organs responsible for normal and complete digestion and by showing you on the diagram the principal digestive glands with their ducts *through* which the socalled digestive juices reach the digestive tube, where these juices meet with the food and drink and mingle with it. I thought, however, that it would be well for some of you to know where the various glands are located, what they are called, and in what manner their juices are conveyed to the alimentary tract. Without such general knowledge, as we possess it today, a resumé of the history of our knowledge about these glands would be meaningless and even boresome to you.

I. *The Discovery of the Digestive Glands and their Ducts*

Glands, including digestive glands, not only abound in the body but many of them had been discovered by pre-Vesalian anatomists. Let me hasten to add, however, that prior to the 17th century *none of the digestive glands were known to possess ducts.* Even Vesalius (1543) knew nothing of them. Franciscus De le Boe (Sylvius) (1614-1672) (not the Sylvius that Dr. Basil Harvey spoke to you about) divided the elongated, spherical, or ovoid circumscribed masses scattered here and there throughout the body and known as glands into two categories: Those glands which were plainly lobulated he called *conglomerate glands;* those which had a smooth exterior and which on dissection revealed no sign of lobulation he spoke of as *conglobate glands.*

The function of the glands was the matter of the wildest kind of speculation and conjecture. If the glands were found at the bifurcation of vessels (parotid, thymus, mesenteric lymph glands (they served as a support for these vessels; if not, they were designed by nature to fill out spaces or, on esthetic grounds, to give a pleasing rotundity to the parts. The thyroid gland, for example, was thought to be necessarily larger in females because the latter needed to have a more beautiful appearing neck than the thin male who might, and commonly does, reveal an unduly prominent and unsightly Adam's apple.

The distinction by Sylvius between conglomerate and conglobate glands, seemingly trivial, turned out to be physiolog-

ically significant; for shortly after (in 1642) Georg Johann Wirsung, prosecutor in Vesling's anatomical laboratory at Padua (Harvey's Alma Mater) quite accidentally discovered the pancreatic duct. The original drawing appears in Vesling's *"Syntagma Anatomicum."* The discovery apparently caused in its discoverer, Wirsung, no ripple of *physiological* interest. He was furthermore shot and killed shortly after, apparently not by a colleague, named Hoffmann, who claimed priority of the discovery, but presumably by some one else who bore him a private grudge.

If you should suppose that the medical world immediately concluded that the pancreas poured out into the intestine a secretion useful or even *necessary* for digestion you are greatly mistaken. The following discussion appears in Vesling's anatomy on the nature of the pancreas and on the significance of his presecutor's discovery of the socalled pancreatic duct:

"The Sweet-bread (Pancreas) is a glandulous part of the *Abdomen*, very profitable for attenuating and purging the *chyle*, and preparing it for the Liver and Spleen before it be turned into blood, for as Nature deduceth the blood itself, which is either for nourishment of the fruit in the womb, or to make the seed for the Generation of it, by divers degrees or steps, even so the Juyce which it turns into blood it alters it in the mouth, concocts it in the Stomach, easeth it of excrements by the Bowels, and by the sweetness of the Sweet-Bread, frees from sharp and salt humors, and therefore the Sweet-bread is alwais full of *Chyle*, as you may find if you dissect a creature alive, and cut it with a knife." * * *

"Also there is a most observable and singular channel in the Sweet-bread, lately found out by our Versungus, which to a curious eye carries the structure and shew of a vein: It ariseth from the Gut called *Duodenum*, sometimes in the extremity of the biliar pore, leaving a common Orifice with an outward shut, sometimes neer the biliar pore, from a distinct place; it is stretched transversely in the Sweet-bread with short, yet very many branches; it is wide at the beginning, and consumes by degrees before it come at the extermity of the Sweet-bread; sometimes it is double in man, but unequal in length, and ariseth neer the biliar pore at about a finger's breadth distance.

"The use of this channel is no waies hard to be found out, for seeing it brings a certain sharp juyce not unlike to the Gall, it separates the juyce of its own Nature from the *Chyle*, and carries it away in the *Duodenum*, and therefore this being stopped, the Sweet-bread swels by reason of the excrements retained; and so, many vessels being by this means compressed, the Liver and Spleen receive no small damage." (From Culpeper's "englished" Vesling's Syntagma, London, 1677.) Vesling obviously thought that the pancreas frees the chyle from excremetitious matter which it excretes through the duct into the intestine.

By Sylvius's classification, the pancreas was a conglomerate gland—one that was lobulated. The discovery of a duct in it induced other anatomists of the time to examine other 'conglomerate' glands for ducts.

In 1654 Francis Glisson published his account of the liver. In preparing the liver for a study of its vessels he boiled the organ and then tediously scraped away the parenchyma. He also macerated the organ and had ants eat away the parenchymatous parts. In such preparation he noted that the biliary passages branched similarly to the vessels. The bile duct system which delivered the bile to the first portion of the small intestine was conceived to be the secretory or, if you will, excretory duct system of the liver.

Another Englishman, Thomas Wharton, published his "Adenographia" (in 1656) in which he describes his discovery of the duct coming from the submaxillary (salivary) gland, also a conglomerate gland. In structure the submaxillary gland resembled the pancreas. If the latter, a conglomerate gland, possessed a duct so should the submaxillary gland. He found on search in an ox that it did possess one and it still bears his name. According to him real saliva and not mere mucus was discharged through this duct into the mouth and that this real saliva had its origin from the nerves (succus nerveus). Aside from its origin he attributed to it a variety of functions and among them was the function of digestion.

The Dane, Niels Stensen (Nicolaus Stenonius) a pupil of F. Sylvius, had hardly begun to dissect when he discovered (in 1661) the duct coming from the parotid gland. It was

a rather accidental discovery but nevertheless important. Knowing from his teacher the difference between conglomerate and conglobate glands he concluded that the former all had ducts and were definitely secretory in function; the conglobate glands, such as the lymph glands, were presumably ductless and he so found them.

Stensen after leading a worldly life became highly religious. He not only took orders but became Bishop of Copenhagen. Even as Bishop he continued for some time to teach anatomy, but soon spent all of his time and efforts in his pastoral duties and ascetic pursuits. He died an ascetic.

It is with regret that I mention solely the names and scientific contributions of the various investigators in this field without even a short paragraph or two on the human side of these worthies. Today's assignment is, however, a heavy one and I must restrict my discussion solely to the scientific accomplishments of these investigators.

With the discovery of these various ducts emptying high up in the digestive tract (salivary ducts) notions concerning the function of these glands changed. In 1664, Regner de Graaf (1641-73) successfully cannulated the pancreatic duct of a living dog and collected juice from this temporary fistula. He obtained as much as one ounce of juice over 6-8 hours of collection; and described the juice partly as *insipid* partly as having an acid taste. You will note that the dog has a Stenson duct fistula as well from which de Graaf collected parotid saliva. Although these first attempts at a collection of fluids, now known as digestive juices, were made by a young medical student of 22, no repetition of them occurred for nearly 200 years!

In 1667, John Conrad Peyer discovered the intestinal glands which still bear his name. Peyer considered these glands anatomically as conglomerate glands with the function of supplementing the activity of the pancreas in the lower parts of the intestine. Shortly after, John Conrad Brunner (1687) discovered glands in the mucosa of the duodenum which taken collectively he was inclined to consider, functionally, as a secondary pancreas, *pancreas secundarium*. With these anatomical discoveries of Brunner and Peyer, the pancreas lost a good deal in importance as a digestive gland, par-

ticularly after Brunner showed that dogs, which had suffered the loss of the greater part of their pancreas, seemed to suffer no digestive disturbances. As a result the stomach was again credited with the major role in digestion (about 1687).

II. *The Theories of Digestion*

With these anatomical and meagre physiological facts before us, we are prepared to consider the notions or hypotheses entertained and defended by our forefathers with respect to the nature of the digestive processes.

According to Hippocrates, and subscribed to by Galen, the aliment is digested in the stomach by *concoction.* I agree with Bostock (1836) that the term is simply another way of expressing what takes place, and fails to explain the process, except that the effective agent in the concoction was parhaps the heat supplied to the stomach (by the neighboring liver).

Having noted that the texture of ingested material was broken down and that the pulpy material acquired a supposedly *disagreeable smell,* some anatomists, physiologists and early chemists defended the *hypothesis of putrefaction.* For example, Cheselden says "digestion is no other than corruption or putrefaction of our food; therefore, meats preserved from corruption by salt or spirits are hard of digestion and unwholesome." The "menstruum" chiefly responsible for this corruption or putrefaction in the stomach was the saliva as well as by "that principle of corruption which is in all dead bodies."

The adherents of the Iatrophysical School attempted to explain the process of digestion solely by *trituration* as exemplified best in animals having a very muscular stomach—such as possessed by many birds.

This view was stoutly opposed by Jean Baptiste van Helmont (1577-1644) and his followers, the Iatrochemists, who contrary to the Iatrophysicists, attempted to explain all living processes in terms of *chemistry.* According to the iatrochemists, digestion was akin to the fermentation observable in the production of wine in which process a good deal of carbon dioxide escapes, as many of you may know. According to Franciscus Sylvius digestion in the intestine was due to the interaction of alkaline bile with *acid* pancreatic juice; for as you may remember de Graaf described pancreatic juice to be

either insipid *or acid*! The point I want to make clear at this time by the examples just given is that Van Helmont's hypothesis of fermentation did not involve the action of a ferment or enzyme in our modern sense. In none of his six types of fermentation, comprising digestion, can one read into the description by the loftiest flights of imagination anything like the current notions of enzymatic action.

I cannot refrain (with an eye on the time) from quoting Cheselden's discussion of the views of one of the iatrophysicists, Dr. Pitcairne, who, he writes: "has computed (the force of the stomach in trituration) to be equal to a hundred and seventeen thousand and eighty-eight pounds weight." Cheselden, *among other things*, wonders why such an extreme force does not digest the stomach itself. The example given reminds me greatly of some of the *calculating* physiologists of the present day. Perhaps they are reincarnations from a previous age!

The final hypothesis, namely, that of *chemical solution*, arose chiefly because *of experiments*. I emphasize it, because *of experiments* on the effect of gastric juice on ingested food. In 1836, Bostock wrote: "We appear to have sufficient evidence to prove that the stomach secretes a peculiar fluid which acts chemically upon the aliment, to reduce it properly to a state fit for absorption and proper nutrition, and that nothing farther is necessary to produce this action than to bring the substances into contact." The days of theorizing are past and the days of experimentation are at last with us. Which reminds me forcibly of the statement of Bacon:

> *"Non fingendum aut excogitandum*
> *Sed quid facit natura, observandum,"*

which to us low brows means in a very free translation:—What nature does is to be observed and not to be previously *figured out* and *excogitated* about [For all I know, it may mean that in our universities there are to be the chairs of *observational research* and not divans for professors of oratory and speculation.]

Let me hasten to tell you about the two experimentalists, Reaumur and Spallanzani, who led the way to our present viewpoint by the humble but fundamentally imperative pro-

cess of thoughtful and tedious observation with all its pitfalls but also with all its blessings for pure and applied science.

René Antoine Ferchault de Reaumur (1683-1757) needed to follow no bread winning career" (Foster). Possessed of ample means he devoted these as well as his own time for and in research. Among other things, he studied digestion as it occurs in birds and published his results in 1752. He had a pet kite, a bird which rejected everything which its stomach could not digest. Reaumur made this bird swallow small lengths of metal tubing filled with meat, the open ends of which were guarded by a screening made of fine wire. When the kite rejected the tubing the meat was partially dissolved out of them. The tubes were furthermore intact. They had withstood the terrific pressure of 117,088 lbs. to which they had been exposed—as calculated by Pitcairne! The tubes were filled furthermore with a "salt rather than bitter" liquid. He put bits of sponges in the tubes and made the kite swallow these tubes. When the kite rejected the tubes, uncrushed, he squeezed out the fluid which the bits of sponge contained and obtained the first samples of pure gastric juice. To this juice, so obtained, he added small pieces of meat, adding similar pieces of meat to an equivalent quantity of water as a proper control. All samples were kept at 32° Reaumur temperature; for he devised a thermometer, still used in Germany, and one which still bears his name. In his second experiment the meat in the gastric juice was partly dissolved whereas the meat in the control tube, i. e., the meat in water, was definitely *putrified. Gastric juice apparently dissolves meat without putrifying it.*

It remained for Lazzaro Spallanzani (1729-1799) to continue Reaumur's experimental researches on gastric digestion using a variety of animals. Though an Abbé of the church he devoted most of his life to a study of geological and biological phenomena—among them, digestion. His experimental work contains ample evidence that gastric digestion or "concoctio" was not the result of putrefaction or fermentation in the sense that that latter term was used but that it was a chemical solution due to the peculiar properties of the gastric juice. As for fermentation, he conceived that the absence of a gaseous product, as in vinous fermentation, sufficed to eliminate the entire theory of fermentation as important or significant. His experiments in refutation of the theories of trituration and

putrefaction are so simple and so masterly that I will quote a few passages from his book to illustrate his mode of thought and his procedure:

Quote:—

"I have before mentioned introducing into the stomach of crows pyriform glass vessels, of which the small end was open, and came out at the mouth.

"I now took two of them and putting some beef, with a little water, into one, and some veal into the other, forced them down the throat of some crows. In order to examine the state of the flesh, I now and then drew them up, and immediately returned them. * * * * At the expiration of the 10th hour, there was a distinct putrid smell that became gradually stronger and stronger. ***** After the glass vessels were taken out of the stomach, I gave one of them (namely, crows) the same quantity of beef and veal; and upon opening the stomach in 3 hours, found that it was entirely consumed.

"These experiments prove that no putrid tendency is ever acquired by meat during digestion. Nor did I ever perceive any such tendency in food lying in the stomach; yet as I had never made experiments for this express purpose, and as some physiologists adduce facts to prove the contrary, I was under the necessity of examining the stomach of various animals, with this sole view.

"Four hens were fed with kid, and in two hours one was killed: * * * the flesh still retained its natural sweet flavor, which at the surface was mixed with a bitterish taste * * * (due to) gastric fluid. It had no smell, * * * An hour afterwards the stomach of another hen was examined; and here the flesh was beginning to be converted into a gelatinous paste, its smell was rather disagreeable; I know not how to describe it, but it was not all all * * * putrid. It had not the lease nauseous taste, nor did it effervesce with acids, or change the colour of the syrup of violets. Thus we see * * * no sign of * * * putrefaction. In another hour the 3rd hen was killed: the stomach contained a pultaceous mass * * * ; but there was not the smallest token of putrefaction." Etc., etc., on other types of animals! * * * "I could not therefore but conclude that there is present in these cases, some cause that prevents the corruption which supervenes outside of the body.

What can this cause be? It was not difficult to detect it. I called to mind those unfinished digestions, which take place when flesh is immersed in gastric fluid contained in phials; where it is dissolved without ever turning putrid, notwithstanding it is kept long enough, and exposed to sufficient heat. I could not then doubt, that the gastric juices are at once solvent, and preservatives from putrefaction. * * * Two phials, one containing some gastric fluid from a crow, and the other from a dog, together with some veal and mutton, were kept 37 days in winter, in an apartment without fire: the flesh was not either consumed or turned putrid; while some that was immersed in water, began to emit a foetid smell on the 7th, and about the 30th day was changed into a very offensive liquamen."

Observing the digestive movements of the stomach in both cats and dogs and recalling that the membranous stomachs of these animals have but a poor musculature as compared with birds he concludes "that the stomach of the dog and cat are not capable of triturating the food * * * but only to expel it into the duodenum."

We have not the time to tell of all the experiments that he performed which could be interpreted most easily by the supposition that gastric juice of all animals including man dissolves food, has antiseptic properties, and stops putrefaction, if putrid meat is put into it by such animals that possessed no teeth for tearing and shredding. Trituration and putrefaction did not account for digestion. It appeared that "gastric fluid" possessed a solvent action peculiar to itself.* He tested out Pringle's notion of the time that its antiseptic properties were due to ammonium chloride and found that a "saltiness" by ammonium chloride equivalent to that of gastric juice did retard putrefaction but did not prevent it unless its concentration was increased 18-20 times. In conclusion, he states: "I therefore chose to acknowledge my ignorance, rather than invent some gratuitous hypothesis; such a mode of proceeding would ill agree with the disposition of one, who has no other object in view than the discovery of the truth."

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*In 1777, Dr. Stevens performed experiments on a half witted Hussar and a variety of animals which supported Spallanzani's contention: Stevens is one of the many unsung worthies of vhysiology and medicine. His "De Aliment. Concoct.", 1777, as well as his life deserve more consideration than has so far been given them.

III. *The More Modern Developments in History of Digestion*

Quite arbitrarily perhaps I view the more modern period in the physiology of digestion to commence with the discovery 1) of the presence of free HCl acid in the gastric juice, and 2) with the discovery of enzymes (or ferments) in saliva and in the gastric juice. After considering briefly these discoveries and the men connected with them I shall consider the rapid sequence of developments in our knowledge of the function of the various glands up to the present time.

1. Discovery of Free Acid (HCl) in the Gastric Juice. On

On June 8, 1803, John R. Young of Maryland submitted to the faculty of medicine of the University of Pennsylvania as his doctor's thesis a paper entitled "An Experimental Inquiry into the Principles of Nutrition and the Digestive Processes." The title page of the thesis bears this quotation from Lavoisier: "We ought in every instance to submit our reasoning to the test of Experiment, and never reach for truth but by the natural road of Experiment and Observation." Young's own experiments on bull frogs (for the most part) showed that the contents of the empty as well as the digesting stomach always proved to be *acid* when tested with litmus. As a result he concluded that the gastric liquor was not, as thought, swallowed saliva (known to be alkaline); and since the fluid contents of the empty stomach were also acid, the acidity of the gastric contents during digestion was not due to the acidity of the ingested meat. Young's friend, Mitchell, had the power to ruminate. The gastric fluid obtained from this human ruminant was subjected to chemical analysis from which Young concluded "that the acid in the filtered fluid was the phosphoric."

As we now know, Young was mistaken as to the nature of the acid; that gastric juice was acid, as stated by him, was known before—as early as 1760. Jean Reuss in that year after neutralizing his own gastric juice with alkalies, ate a meal of meat and vegetables. By aid of an emetic he caused himself to vomit three hours later and noted subjectively not only an acid taste but observed that the gastric contents changed the infusion of "campanules" to a red color.

A blot on John Hunter's career is the scornful attitude on the contributions of Reaumur and particularly Spallanzani.

I cannot refrain from quoting him to show his attitude towards both who were not, like himself, practicing physicians. He writes: "It happens unfortunately, that those who from the nature of their education are best qualified to investigate the intricacies and improve our knowledge of the animal economy, are compelled to get their living by the practice of a profession which is *constant employment*. The only *idle* professional men are those of the Church; and we therefore frequently see them becoming philosophers and physiologists, as it were instinctively, without having had that kind of education which might direct their pursuits."

The long and the short of it is that a great number of investigators, before and after Young, described the contents of the empty and full stomach as acid. Dispute arose next as to the nature of the acid. Young found it to be phosphoric acid. The finding was confirmed by Prout (1826?), and by Claude Bernard and Barresville (1844). Later, others thought it to be acetic and then butyric acid. The greatest discussion centered about the acidity being due to lactic or hydrochloric acid. Time does not permit giving the detailed reasons why Prout (1823) proclaimed the acidity as being due to HCl acid (published in 1824). In 1824 also Gmelin and Tiedemann came to the same conclusion (see preface to their two volume work), but they did not publish their results until 1826. Most observers confirmed these results. However, the great Claude Bernard attempted to influence the scientific world (*by experiments, of course*) that the acid was lactic acid. So the controversy persisted "with 14 votes for HCl, 12 votes for lactic acid, and 2 votes for calcium phosphate," until, Bidder and Schmidt in 1852 convinced all scientists up to, and including, the present day that the acid is HCl acid.

In outlining to you briefly the progress in the determination of the nature of the acidity of gastric juice I arrived quite rapidly to the last date of 1852 when the identity of HCl acid was firmly established by Bidder and Schmidt. In pursuing this line of thought I passed by the very important date of 1833—the year when Wm. Beaumont published his "Experiments and Observations on the Gastric Juice and the Physiology of Digestion." These experiments were performed on Alexis St. Martin, who was injured by the accidental discharge of a musket at close range. "The contents" * * * lit-

erally blew off the integuments and muscles of the size of a man's hand, fracturing and carrying away the anterior half of the 6th rib, fracturing the 5th, lacerating the lower portion of the lobe of the lung, diaphragm and perforating the stomach, the portion of the stomach protruding, lacerated through all its coats, and pouring out the food he had taken for breakfast, etc." (Beaumont). The patient recovered under Beaumont's care, there remaining a gastric fistula, namely, an artificial opening between the anterior belly wall and the interior of the stomach.

The early experiments on this paid human laboratory subject were performed on the Island of Mackinac. Beaumont studied the motility of the empty and full stomach, its temperature, rate of digestion, of various food stuffs introduced at the end of strings through this artificial stomach. Time does not allow us to record the many interesting data obtained. The experiments performed on the frontier and hundreds of miles from anything that could be called a laboratory, will, I think, forever excite scientific admiration. What is most important to us *just now* is that many investigators, including Claude Bernard, took the clew and prepared artificially in dogs gastric fistulæ similar to the one accidentally produced in Alexis St. Martin in the wilds of northern Michigan. This in turn led to the production of the Heidenhain pouch in 1881, and to the Pavlov pouch in 1889. As a consequence Pavlov made permanent fistulæ of the other digestive glands (parotid, submaxillary, pancreatic and biliary fistulæ) and subjected many of the digestive glands to a close experimental study in animals that otherwise were living a normal life. A variety of stomach pouches were made for the study of specific problems, such as the Bickel-Heidenhain and the Læster Dragstedt and Ivy pouches. On the basis of results derived from this type of experimentation on animals living a normal existence many of the problems of gastric secretory phenomena have been elucidated, and more is being learned daily. It is irrelevant in a talk of this kind, even if time permitted, to mention before this audience, the results thus far obtained. I do wish to emphasize, however, that our own Beaumont of Mackinac Island pointed out the way and is quite directly responsible for subsequent developments in the field of digestion. *So much in biological advance depends on proper methods for use in the scientific approach.* In the discovery of insulin,

Banting's success, in my estimation, depended greatly on an accurate blood sugar method; in the present field of digestion so much depended on the proper methods for studying the mechanisms of action of the digestive glands. Beaumont pointed out the way! Heidenhain, Pavlov, and others exploited the field scientifically by following in principle his line of approach. The line of approach consisted of course in the artificial production of fistulæ of the various ducts coming from the various digestive glands in animals living an otherwise normal and contented life and studying the biochemical properties of the juices so obtained.

2. **The Discovery of Digestive Enzymes.**—Among other things Beaumont concluded about Gastric Juice "that it contains free Muriatic Acid and some other *chemical* principles" responsible for the digestion of food. What these "principles" were, he did not speculate about. As early as 1814, Kirchhoff read a paper (published in 1815) in which the first preparations of a crude enzyme are described in an article entitled "Ueber die Zuckerbildung beim Malzen des Getreides und beim Bebruehen seines Mehles mit kochennem Wasser" (as pointed out recently by Walton). Kirchoff recognized the catalytic nature of the preparation and even gave a description of the optimum conditions of activity.

In 1834, Eberle showed that a combination of HCl acid and gastric mucus dissolved certain food substances decidedly better than either alone; and he concluded that the mucus contained a specific digestive ferment. In 1832-33 Payen and Persoz prepared from malted barley an extract, much after the manner of Kirchhoff, which easily converted at moderate temperatures what strong acids ordinarily do at more elevated temperatures. In 1835, Schwann isolated the chief ferment of the gastric juice, showed that it reduces proteins to peptones, and gave it the name "pepsin"—a name which it still retains. In 1838, rapid conversion of sugar to alcohol was detected to be due to *living* ferments, *the yeast celli; the non-living ferments* having a similar catalytic activity were spoken of as *enzymes* by Willie Kühne.

We have said much, perhaps too much, with respect to various phases of gastric (stomach) secretion. In fact, so much work was done on digestion by the stomach that the *pancreas* and its secretion, as studied by Regner de Graaf, was entirely

forgotten. But a chance *observation* by Claude Bernard created fresh and fruitful interest in this digestive gland. With his co-worker, Barreswill, Bernard noticed that, in animals at the height of digestion, the lacteals were filled with a whitish fluid at a point *below* the *entrance of the pancreatic duct* into the duodenum. This fact intrigued him; and he subsequently devoted much *experimental* effort in studying the properties of pancreatic juice; for he correlated the character of the lymph in the lacteals with the possible activity of the pancreatic juice delivered into the intestine. The investigations were highly fruitful. In turn, he discovered by tedious and exciting experimentation that the pancreatic juice possessed a triple enzymatic action, in the Kühne and Berzelian sense; for he found that pancreatic juice had the property of not only converting protein food into chemical products susceptible of absorption, but that this same juice could with the greatest of ease change starches into simple sugars and change the ingested fats into products capable of being absorbed by the lacteals coming from the intestinal tract. It was the absorbed fats which made the chyle white or "milkish." In fact, he found that this juice was the cause of the variety of its actions on all food stuffs, decidedly more important than the highly vaunted and greatly extolled gastric juice. The property of the bile in emulsifying the fats preparatory to their digestion was discovered soon after. The nature of the various essential food stuffs having been discovered, Claude Bernard showed that pancreatic juice converted each of these primary food stuffs into simple chemical compounds, capable of absorption and therefore of distribution via the circulation to all of the tissues and organs of the body for their utilization.

Every layman knows from personal experience that a mouth moistened by saliva, poured out by the salivary glands, is necessary for phonation (speech) and for swallowing. That the parotid saliva of the human is capable of digesting cooked starches is known only to the person instructed by the physiologist. Without such digestion either by the saliva or the pancreatic juice ingested farinaceous material would be of no avail to us in any nutritive sense whatsoever; for these two secretions by virtue of the enzymes, ptyalin and amylopsin respectively, convert cooked and uncooked starches into products (by virtue of their enzymatic (catalytic) action) that are of the greatest value to the animal economy.

Many, if not all, of the digestive glands are under nervous control meaning thereby that the nervous system has a certain amount of control over them. Just how and when the central nervous system excites them to deliver their important juices in the interest of a proper digestion of the foods would require a discussion which, I am afraid, would be too technical for the majority of this audience .

However, I would not feel satisfied if I would close this discourse by having you believe that only by nervous influences are these digestive glands kept functioning properly and opportunely. Some of the glands are under a chemical control meaning thereby that the nervous system has a certhe closing minutes of this talk. Claude Bernard knew that ether introduced into the duodenum would cause the pancreas to secrete abundantly. He explained this fact by assuming a possible reflex action. Acid introduced into the duodenum has the same effect. It was not until 1902 that Bayliss and Starling showed that when *acid is* introduced into the intestine a substance is liberated from the intestinal wall which on reaching the general circulation also reached the pancreas and incites particularly this organ, the pancreas, as well as the liver and intestinal mucosa, to marked secretory activity. This substance dubbed by Bayliss and Starling "secretin" is one of the many "hormones," namely, *chemical messengers* which liberated into the blood stream produce effects in distant parts. The same acid introduced into the duodenum liberates a still different hormone from the intestinal musoca discovered recently by Ivy of Northwestern University Medical School and named by him "cholecystokinin," and which causes on absorption an expulsion of bile from the gall bladder. We have then, it would appear, from data obtained *by experimentation* two types of control of the digestive glands, namely, a nervous control and a hormonal control. Some of the absorption products may themselves excite secretory processes. This type of *chemical control* is particularly significant in connection with the secretion of gastric juice.

If you have read between the lines, the value of animal experimentation in the elucidation of the problem of digestion must have been plain to you. As for the rest, may I again refer to Bacon's dictum:

Non fingendum aut excogitandum
Sed quid natura facit, observandum.

The ideas and "excogitations" of the 'wise men' of the past on concoction, trituration, fermentation, and putrefaction were words and ideas suitable for disputation. And there *was* plenty of disputation! The real explanation of digestion *by chemical enzmatic solution* rests *on experimental work* confirmed and generally agreed upon by investigators in the field. This work brought us to the present state of our knowledge both for *academic* consideration and *practical* guidance in the clinics; for *facts* obtained by the experimental method remain *true* and *fresh*. It is our ideas about them that do the *ageing*.

Rise of Our Knowledge of the Mode of Action of Peripheral Nerves and the Rise of Our Knowledge of the Central Nervous System

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Introductory

I have read the changed title in full so that there will be no misgivings in your mind about the content of the proposed lecture during the ensuing hour. Even without reference to the special senses, I have found the task most difficult. Because of the intricacies of the task, the present historical review will be extremely sketchy and, perhaps, quite uninteresting.

II. *Review of the Gross Anatomy of the Central Nervous System and the Peripheral Nerves*

(Show hardened cerebrum, cerebellum, and spinal cord, with peripheral nerves.) Point out cerebral hemispheres, hollowness of the lateral ventricles, the basal nuclei, the cor-

tex, the cranial nerves, the medulla, and spinal cord with its paired nerves for each segment.

III. *Early Knowledge of the Central Nervous System*

According to Prof. Breasted, the Edwin Smith papyrus dates back to the 17th century before Christ. In one of the case histories occurs the following passage which clearly shows that this early surgical writer was familiar with the brain and its convolutions, the cerebro-spinal fluid and perhaps the dura mater. I quote Prof. Breasted's translation of Case Six: "If thou examinest a man having a gaping wound in his head, penetrating to the bone, smashing his skull, (and) rending open the brain of his skull, thou shouldst probe his wound. Shouldst thou find that the smash which is in his skull (like) those corrugations which form in molten copper, (and) something therein throbbing (and) fluttering under the fingers, like the weak place of an infant's crown before it becomes whole ***** and he discharges blood from both his nostrils, (and) he suffers stiffness in his neck **** (Thou shouldst say) "An ailment not to be treated" *** As for: "Smashing his skull, (and) rending open the brain of his skull;" (it means) the smash is large (and) open to the interior of his skull, (to) the membrane enveloping his brain, so that it breaks open his fluid in the interior of his head." As for: "Those corrugations which form on molten copper," it means copper which the coppersmith pours off (rejects) before it is put into the mould, because of something foreign on it like wrinkles."

Case Eight can be considered to be a description of a contré coup fracture of the skull with brain injury and a resulting hemiplegia; Case 20, perhaps, a motor aspasia; Case 33, a complete paralysis of arms and legs from "a crushed vertebra in the neck." Etc., etc.

In short, this very early author was familiar with a great many nervous manifestations resulting from injuries to the brain and spinal cord and as we know them today.

Hippocrates (460-370 B. C.) described disorders of locomotion and tetaniform convulsions; Aretaues the Cappidocian (ca. 200 A. D.) was familiar with the fact that lesions of the central nervous system caused paralyses of the opposite side of the body; whereas a spinal cord lesion caused paralysis of

the limb of the affected side. Galen, who lived about the same time (131-201 A. D.), was not only familiar with such facts, but as an early experimental physiologist produced a number of lesions in the spinal cord and peripheral nerves and studied subsequently the defects caused by his several nervous system injuries. We shall return to his rsearches later in the hour.

IV. *Development of the Various Conceptions of Nerves and Nervous Action*

Aristotle (384-322 B. C.), like many after him was not only mistaken about the origin of the peripheral nerves throughout the body but confused the nerves with tendons and sinews generally. In fact, it is difficult for me to believe that his statements concerning nerves were based on even the most cursory observations. In his "Historia Animalium" he writes: "The sinews of animals have the following properties. For these *also* the point of origin is the heart; **** "In the ham, or the part of the frame brought in the effort of leaping, is an important system of sinews; **** "for all the bones that are attached to one another are bound together by sinews, etc." Again: "There is a very extensive system of sinews connected severally with the feet, the hands, the ribs, the shoulder blades, the neck, and the arms." May I anticipate a supposed anatomical fact based perhaps on Aristotle's confusion of the nerves with tendons by stating at this point that many biologists believed the nerves which entered muscle tissue to be coterminous with the tendinous inscription of muscle on bone or at a joint. The confusion of nerve with tendon was due to a superficial resemblance of the one with the other—particularly in certain parts of the body.

The relation of the nerves to the skeletal musculature was observed early. Galen and others of his time also noted that a paralysis of the muscle ensued when its nerve was sectioned. Just how a nerve influenced a muscle to cause it to contract was a subject of much speculation. As late as 1732 (and later) Monro writes: "Some allege that the nervous fibres are all solid cords acting by elasticity or vibrations; others maintain that these fibres are small pipes conveying liquors, by means of which their effects are produced."

A variety of objections was raised against the view that the nerves were solid elastic cords that acted on muscle, for

example, like strings, or conveyed impression to the brain by their specific vibration. According to this view sensations should always be the same since the "tension, length and texture" of the nerve remains the same. As for muscular motion being due to the elasticity of the nerves it was pointed out that the nerves were not only too weak in texture "to resist such weight as the muscles sustain" and that the microscope fails to reveal any "contraction or motion" in the nerve "while the muscles it serves are in motion." It therefore seemed more probable to our early investigators that the nerves were tubes which discharged a succus nerveus, or nerve juice, into the muscle. In Galen's time this nerve juice was the 'animal spirits' elaborated by the brain from the more subtile matters of the arterial blood reaching it via the carotid and vertebral arteries. When the microscopist, Malpighi, described the brain as a secretory organ by virtue of its grey matter the histological evidence supported the view. The grey matter secreted a tenuous substance in the form of some kind of liquid which escaped along the nerve tubules and into the muscles during rest and, as it were, sweat it out along the tendinous inscription of the muscles, or exhaled it in some ill defined fashion through the skin or into the body cavities. And, since the brain was surrounded by a watery liquid and since a similar liquid was present in the ventricles some notables such as Descartes thought of this fluid, the cerebrospinal fluid, as the tenuous subtile fluid which passed out to muscles as the "animal spirits," or in later times as the succus nerveus or nerve juice. When by some ill defined mechanism a greater quantity than usual of this succus nerveus or nerve juice reached a muscle, an effervescence or ebullition occurred as a result of the interaction of the nerve juice and the muscle substance or some substance brought to the muscle by the artery (Mayow). This ebullition caused the muscle to belly out and, in doing so, to become shorter. This conception was supported by certain facts whose interpretation lent credence to the view. For example, Monro (1732) says he will "mention an experiment which (they think) directly proves a fluid in the nerves. It is this: After opening the thorax of a living dog catch hold of and press one or both the phrenic nerves with the fingers, the diaphragm immediately ceases to contract. Cease to compress the nerves, and the muscle acts again. A second time lay hold of the nerve or nerves some way above the diaphragm, its motion stops. Keep firm the

hold of the nerves, and, with the fingers of the other hand strip it down from the fingers which make the compression towards the diaphragm, and it again contracts. On repetition of this part of the experiment 3 or 4 times, it is always attended with the same results; but it then contracts no more, strip as you will, etc., etc. **** Let anyone try if he can imagine any other reasonable amount of these appearances than than that of the pressure by the fingers stopped the course of the fluid in the nerve; that so much of this fluid as remained in the nerve betwixt the fingers and the diaphragm was forced into that muscle by stripping; and when it was all pressed away, the fingers were removed and a fresh flow by that means was received from the spinal marrow or from that part of the nerve which had not yet been so stripped."

Even at the time that Monro was writing evidence was at hand that the contraction of muscle was not due to an inflation resulting from the interaction of nerve juice and some constituent in or supplied to the muscle by the blood stream. Even Galen, chiefly responsible for the early conception of this view, knew in the second century A. D. that excised muscle tissue could be excited to contract by mechanical stimulation. Swammerdam and Glisson independently subjected the theory of ebullition to experimental tests. They argued that the theory of effervescence presupposed an increase in volume of the muscle during the active phase of muscular contraction. Suffice it to say, that the experimental tests of both observers showed not an increase but as Swammerdam (1664) states, even a diminution of volume, if any change at all. The set-up used by Swammerdam is here represented. There are other worthies, such as Mayow and Stenson, whose work should have convinced the physiologists of the day and subsequent writers on the subject that the succus nerveus was a clever figment of the imagination. However, time borbids; and we must end this superficial account and pass to Galvani and his superior scientific adversary, Alessandro Volta. This leads us to a consideration of the rise of Electrophysiology and its bearing on the nature of nerve action.

During the summer of 1786 Galvani and his good wife were testing the effect of atmospheric electricity on frogs' legs. It was observed that frogs' legs developed spasms on being suspended from copper wire or hooks *providing* the legs came in contact with an iron ballustrade. The results were

interpreted by Galvani as due to animal electricity, whereas Volta, Professor of Natural Philsophy at Pavia, ascribed the results to *electricity* resulting from the union through a conducting (tissue) bridge of dissimilar metals. Volta was, of course, correct in his interpretation. However, the controversy led Galvani or his nephew, living with him at the time, to cause contraction of muscles *without* the use of a metallic bridge of dissimilar metals. In this discovery or re-discovery, Alexander v. Humboldt (1797) and Carlo Matteucci (1838) are particularly pre-eminent. The latter, particularly, established the fact that there exists a difference in potential between the uninjured surface of a nerve and its injured muscle leading to a contraction of the muscle when both are brought in contact with each other. Animal electricity as exemplified by this so-called "current of injury" was definitely established. However, as a result of his controversy with Galvani, Volta (1799) discovered the electric battery based on the original experiments of Galvani and misinterpreted by the latter. Matteucci's paper handed to Emil du Bois-Reymond (1818-1896) and dealing with the "current of injury" stimulated du Bois-Reymond to that series of brilliant researches which not only enriched the physiological armamentarium in the form of electrical apparatus still used daily throughout the world but lead also to the discovery of electrotonus, change in reaction towards the acid side when muscle is thrown in marked activity, etc. But Matteucci made another brilliant discovery, namely, that of "secondary contraction". He showed (1842) that "when the nerve of one limb of a frog is placed upon the muscle of a similarly prepared limb, the first limb will contract whenever the muscle of the second limb is caused to contract" (Fulton). The second muscle contracts because of "animal electricity" or an action current, specifically, a "muscle current" developing in the active muscle. With the development of sensitive physical instruments these minute electrical currents, namely, "currents of injury" and "action currents" were soon measured. Promptly the active state of excitation passing down the nerve to the muscle was identified with electricity. Johannes Müller spoke of the rate of propogation as being immeasurably fast and incapable of determination. Within 6 years or so Helmholz, his pupil, not only measured this physico-chemical process now known as the nerve impulse but

showed it to have a relatively slow rate of transmission, namely, 27-125 meters per second (1852).

I have reviewed in rapid sequence (1) the possibility of stimulating irritable tissues by electricity (Galvani), (2) the development of electrical changes in tissues during activity as exemplified by the current of injury and the action current or negative variation (Matteucci, du Bois-Reymond, et alii) ; and (3) the discovery that the nerve impulse travels at a moderate speed down the nerve—a speed identical with the wave of the action potential. In recent years our own Ralph Lillie has presented strong experimental evidence that the nerve impulse is a surface phenomenon. By the use of his iron wire model he has duplicated many of the characteristic phenomena of nerve.

The more recent developments are perhaps too technical for this audience except to say that as the result of the passage of the nerve impulse, CO_2, is produced (Tashiro) ; and that A. V. Hill has measured the heat produced during the physico-chemical processes responsible for the traveling action potential.

With better microscopes it was shown in the middle of the last century that the nerves were not tubes and that the nerves were the outgrowth of ganglionic cells present in the marrow of the spinal cord, cerebral cortex, or other grey matter of the central nervous system Helmholz (1842). Whereas the succus nerveus flowing in tubes was no longer discussed, Köllicker's Histology of 1867, 25 years later, still called the nerve fibres the "tubuli nervei".

V. *The Discovery of Reflex Action In or By the Nervous System*

1. **Early History.** In a certain sense we can attribute a knowledge of specific muscular coordinations now spoken of as reflex acts to early Greek physicians and their successors. In pseudo-scientific explanations of their observations they spoke of a "sympathy" between the parts lying, very often, at some distance from each other. For such vague notions the listener had perhaps best read Whytt's Nervous Disorders (1767).

The real doctrine of reflex action took a more concrete

form in the mind of René Descartes (1596-1650). In his "Passiones Animæ" prepared for Christina, Queen of Sweden, occurs this passage which freely translated reads as follows: "If anyone quickly extends his hand to our eyes and even if we know that he is our friend and does so only jocularly * * * we can nevertheless scarcely keep from closing them. Which shows that they are not closed by an operation of our mind, since it is done contrary to our will * * * But because the machine of our body is so constructed, that the motion of his hand towards our eyes excites another motion in our brain, which deduces animal spirits into those muscles which depress our eyelids." (1649).

The precise mechanism by means of which this and kindred reflex acts were performed was very simply explained by Descartes and approximates in principle, at least, our present notions of the so-called reflex arc. In this matter Descartes made a wild but lucky guess. According to him the nerve fibre is a hollow tube starting in the brain, specifically in the ventricles of that organ, and ending peripherally, let us say in the skin. Not only was the nerve fibre a hollow tube but it contained throughout its course delicate threads which we might speak of as neurofibrils to dub them with a modern name. When these Cartesian neurofibrils were pulled on or stretched they opened up hypothetical valves in the ventricles of the brain allowing the animal spirits or succus nerveus to rush down appropriate nerve tubules to the proper musculature with the result that the hand, for example, was promptly withdrawn. You will note that the hypothetical set up operated quite *automatically*.

The pineal gland on the top of the brain and between the two cerebral hemispheres was found *by him* as the only unpaired structure of the brain. He therefore considered it the seat of the soul.* Most if not all of the threads of his nerves conveying sensory impulses upwards made connections with the pineal gland, which by wagging this way or that could open valves to this nerve tubule or close the valves of another and thus modify the muscular response by virtue of the *soul* which it contained.* Descartes surmised also the phenomenon of reciprocal inhibition which he explained by the disposition of valves within the nerve tubules.

*Van Helmont noting the apparently arbitrary activity of the pyloric sphincter during digestion was inclined to seat the soul in the pyloric region of the gut.

Robert Whytt (1714-66) observed spontaneous reactions on the part of animals as a result of stimuli affecting the organism,—reactions which he held to be frequently devoid of any governing principle *endowed with reason*. In his "Physiological Essays" (about 1755) he writes: "If the soul were confined to the brain **** , whence is it that a pigeon not only lives for several hours after being deprived of his brain, but also flies from one place to another? And to what cause are we to ascribe the continuance of life and motion in a viper for three days after its head is cut off, and in a tortoise for three weeks after decollation, and six months after the loss of its brain. **** The late Reverend and ingenious Dr. Hales informed me that having many years since tied a ligature about a frog's neck, to prevent any effusion of blood, he cut off its head, and, 30 hours after * * * the frog * * * moved its body when stimulated; but, on thrusting a needle down through the spinal marrow, the animal was strongly convulsed, and, immediately after, became motionless."

Whytt himself made many such experiments showing that purposeful but involuntary motions could take place owing to a "sentient principle" present in the cord. He even observed the phenomenon of spinal shock which he ascribed thus: "it is very remarkable, that, when the toes of a frog are pricked or otherwise wounded instantly after decollation, there is either no motion produced in the muscles of the legs at all, or a very inconsiderable one. But, if the toes of a frog be touched with one's finger ten, fifteen, or twenty minutes after decollation, the legs and thighs are immediately drawn up to its body, etc." He then proceeds to enumerate a number of involuntary motions. "More examples" he writes "might be given; but these may suffice to show the connexion there is betwixt the sensibility and irritability of the moving organs of our body." But he observes furthermore "that when, after decollation, a frog's spinal marrow is destroyed with a red hot wire, no visible motion is produced in its limbs or body by pricking, cutting, or otherwise hurting them." After the destruction of the spinal marrow "there was no sympathy between the different muscles * * * whence it seems to follow that the nerves distributed to the several parts of the body have no communication but at their termination in the brain or spinal marrow; and that to this, perhaps alone, is owing the consent or sympathy observed between them." That he

was familiar with so-called tonus and tonic states follows from this generalization: "There is a natural contraction of muscles resulting from a constant and equable action of the nervous power upon them."

2. **Modern Period.** We turn next to the discovery of motor and sensory nerves—a discovery associated with the names of Charles Bell (1774-1842) and Francois Magendie (1783-1855). Prior to their anatomical and physiological investigations all nerves were considered 'sensible'; i. e., irritable. Together and independently of each other these two investigators showed *that some nerves are distinctly sensory and that others are distinctly motor.*

Charles Bell made extensive investigations of the nervous system and particularly the nerves coming from it. Among other things he noticed that some of these nerves possessed ganglionic swellings whereas others did not. Similar observations had been made before him but no one specifically inquired into the reason of this arrangement. Like others he noted that the spinal nerves came off in pairs, a right and left pair for each segment of the spinal cord. The posterior root of each of these pairs possessed a ganglionic swelling; the anterior roots did not. He was aware of the fact that two nerves supply the facial region. One, the trigeminus, had a ganglionic swelling; the other, the facial, contained no ganglionic swelling along its course. It had been supposed that these two nerves were mutually supplementary to each other in case of injury to either one. Bell was not satisfied with this or the other current notions about the functions of the ganglions. He severed the facial nerve in an ass and produced a facial paralysis; the sensibility of the facial region was unimpaired. But when he severed the trigeminus nerve —the nerve with the ganglionic swelling and a nerve which is also distributed to the face, he noted *solely* loss of sensation of the parts innervated. These observations together with other anatomical facts suggested that the separate roots of the spinal nerves also had a dual function, namely, that the roots with a ganglionic swelling were sensory and that the anterior roots, without the swelling or ganglion, were motor. He writes: "After delaying long on account of the unpleasant nature of the operation, I opened the spinal canal of a rabbit and cut the posterior roots of the nerves of the lower extremity; the creature still crawled, but I was deterred from

repeating the experiment by the protracted cruelty of the dissection. I reflected, that an experiment would be satisfactory if done on an animal recently knocked down and insensible. **** A rabbit was struck behind the ear, so as to deprive it of sensibility by the concussion, and then I exposed the spinal marrow. On irritating the posterior root of the nerve, I could perceive no motion consequent in any part of the muscular frame; but on irritating the anterior roots of the nerve, at each touch of the forceps there was a corresponding motion of the muscles to which the nerve was distributed. Every touch of the probe or needle on the threads of this root, was attended with a muscular motion as distinct as the motion produced by touching the keys of a harpsichord." He therefore interpreted the dual innervation of a part in terms of the dual function of the respective nerves innervating it. In fact he read a paper before the Royal Society (1826), entitled "On the Nervous *Circle*, which connects the Voluntary Muscles with the Brain."

Like Bell, Magendie had speculated on the possible functions of the anterior and posterior roots of the spinal nerves but was less timid about experimenting on them. He sectioned the posterior nerve roots and noted invariably a loss of sensation of the parts supplied by the nerve. On sectioning the anterior roots the leg showed a flaccid paralysis but no loss of sensibility. Section of both roots was followed by both loss of sensibility and motion of the affected part (1822).

With the experimental data collected by Whytt, Bell and Magendie at his command, Marshall Hall (1790-1857) had little difficulty in formulating, on the basis of experimental work, the modern theory of reflex action; and that, specifically, the spinal cord, functions, in part, as a reflex center. He was led to this important discovery in the course of investigations on the circulation through the lung of a triton. He writes: "It was during the course of this investigation that I was struck by the fact which led to the discovery of the spinal system. The decapitated triton lay on the table. I divided it between the anterior and posterior extremities, and I separated the tail. I now touched the external integument with the point of the needle. It moved with energy, assuming various curvilinear forms! What was the nature of this phenomenon? I had not touched a muscle, I had not touched a muscular nerve, I had not touched the spinal marrow. I

had touched a cutaneous nerve. That the influence of this exerted through the spinal marrow was demonstrated by the fact that the phenomenon ceased when the spinal marrow was destroyed. It was obvious that the same influence was *reflected* along the muscular nerve to the muscles, for the phenomenon again ceased when the nerves were divided. And thus we had the most perfect evidence of a *reflex*, a diastaltic, or a diacentric *action*." It may interest you to know that a second communication on this fundamental discovery and read before the Royal Society (1837) "was refused a place on the records of British Science. **** In short, it was rejected by the Royal Society." So writes Mrs. Hall in the Memoirs of her husband.

VI. *The Medulla—The Spinal Cord as a Conducting System*

In the establishment of the spinal cord as a reflex center other investigators played an important role whose names, for lack of time, I did not even mention. One of them—and the most important perhaps, was César Legallois (1770-1814). I wish to speak about him, however, particularly with respect to his work on the localization of the respiratory center in the medulla—a discovery of great significance in the early history of cerebrospinal localization. Legallois repeated his experiments before a commission assigned to investigate his claims. This commission reported as follows: "The author took a rabbit * * * * ; he separated the larynx * * * * that he might observe its movements * * * * ; after which he opened the cranium, then took out the cerebrum and afterwards the cerebellum. After this double extraction, the inspirations continued; they were characterized each by four movements, which took place at the same time; namely, a gaping, the opening of the glottis, the elevation of the ribs, and the contraction of the diaphragm. **** Then "the author extracted the medulla oblongata; and at the same instant these motions ceased all at once. **** The same experiment was repeated **** with this difference, that after the extraction of the cerebrum and the cerebellum, **** the medulla oblongata was extracted successively by slices of about 3 millimeters in thickness **** . The four inspiratory motions continued after the extraction of the first three slices; but they were suddenly stopt after that of the fourth. **** This fourth slice included the origin of the nerves of the eighth pair" (now known as the Xth).

Some 1600 years before Legallois, Galen in working on the spinal cord of lower animals discovered the pathways in the cord responsible for the transmission of the nervous impulses from the respiratory center to the various muscls concerned in respiration. He was obviously not capable of appreciating fully the value of his discovery. Experimenting in the 2nd century A. D., Galen records his observations as follows:

"If you cut completely through in the interval between the third and fourth vertebra, the animal at once ceases to breathe, the chest wall and all parts of the body below the line of section becoming motionless. And it is clear that if the incision is made between the second and third vertebra, or between the first and second, or at the base of the brain, the animal at once dies. But if the incision is made between the 6th and 7th (and it must be remembered that the section should be carried right through), all the muscles of the thorax immediately cease to function, and the animal uses only the diaphragm in breathing." (Prendergast.)

Since we are at Galen, allow me to enumerate his other experimental contributions to our knowledge of the nervous system: (1) lack of voice (aphonia) following section of the recurrent laryngeal nerves; (2) paralysis of one half of the body by lesions of the brain on the opposite side; (3) complete paralysis of the lower limbs on complete section of the spinal cord; (4) paralysis of one lower limb on the same side after half section of the spinal cord; (5) paralysis of the bladder and intestines on complete section of the cord.

Galen *experimented* as well in other fields. Little wonder then that his successors over the centuries that followed—successors who did not follow his *precept or example*—held him in reverential awe. In its last analysis this awe for him was inspired *not by what ideas he had on the subject except as his ideas were the result of observations and experimentation.* His followers wrote nothing but commentaries on his writings for some 1400 years. Their ideas in these commentaries were sterile from the point of view of advancement of biology or practical medicine.

VII. *The Cerebral Hemispheres*

As mentioned early in this paper clinical experience and some experimental work on animals (Monroe, 1732) indicat-

ed that the cerebrum with its different parts had a variety of functions. By the beginning of the 19th century most biologists interested in the matter were inclined to the belief that the cerebrum, as the seat of consciousness, acted as a whole. About this time a Viennese physician named Gall assisted by Spurzheim proposed the system of cranioscopy, or, as it was later termed, phrenology. According to this system different mental faculties were mediated by different parts of the brain. According to its originators, the more dominant a given faculty in a given individual the larger would be the part of the brain concerned in it. Gall and Spurzheim concluded that the bone of the skull immediately overlying such an enlarged area would be bowed out. The various areas of the brain were mapped out as to their hypothetical functions. An examination of the protuberances and irregularities of the skull presumably sufficed to divulge the nature of the man as a whole or his proclivities (such as amativeness, combativeness, etc.). To their credit be it said that they made important contributions to our knowledge of the finer structure of the nervous system. Phrenology itself, however, soon became an excellent system for exploitation by charlatans.

It was soon discovered that an injury to the third frontal convolution on the left side of a right handed individual caused loss of articulate speech or of speech itself. The value of Broca's discovery indicating a possible cerebral localization was however not appreciated at the time. Previous attempts at stimulating the cerebral cortex by means of acids and, mechanically, by means of wooden sticks showed the cerebrum in all its parts inexcitable. In 1870, Fritsch and Hitzig stimulated the exposed cortex of dogs electrically, and observed that such stimulation over particular areas gave definite motor responses in the face and limbs of the opposite side of the body. The work was confirmed and extended not only to the chimpanzee by Sherrington and Greenbaum but also to man by various neuro-surgeons in the course of necessary operations on the human brain. By the method of experimental extirpation of different parts or destruction by tumorous growths in man a good deal has been learned about so-called cerebral localization. In 1892, Goltz succeeded in removing the cerebrum of dogs, or most of it. These decorticated animals suffered only intially from motor paralysis. In fact, in later months they showed an unusual amount of activity. The

most striking defect evinced by such animals was loss of every vestige of what might be called intelligent response related to past experiences.

VIII. *The Cerebellum*

Earnest and concerted efforts designed to unravel the mysteries of the cerebellum began with the work of Rolando and Flourens. The chief method of attack that has yielded striking results was the method of partial or complete removal of that organ. Such mutilating operations on it are followed at first by a marked inability of the animal to stand or walk. Even after recovery from the immediate effects of the removal, the animal has difficulty in properly coordinating its movements. Similar results are observed in man where this part of the brain is destroyed by disease. Luciani after prolonged experimentation came to the conclusion that these results are due to irritative motor outbursts by the lesion. He found that with time these symptoms disappear; and he and his pupils are convinced that the real deficiency symptoms reveal themselves later, namely, in atonia and asthenia. In interpreting these symptoms, atonia and asthenia, most writers have in mind a possible regulating and reinforcing influence exercised by the cerebellum on the neuro-muscular apparatus.

IX. *The Tuber Cinereum*

More recently it was found by the careful experimentation of Philip Smith that removal of a small prominence on the under surface of the brain called the tuber cinereum is related in some way with metabolic processes of the body and with sex. When this small prominence is extirpated, the animal not only becomes exceedingly fat but its sexual apparatus either fails to develop, or if already fully developed at the time of operation, becomes atrophic. The hypophysis, or pituitary gland, close by, is anatomically at least a cerebral structure. Its most important part physiologically considered has its origin from the buccal mucous membrane and therefore can scarcely come in for a review here. It has, furthermore, not a nervous but a specific endocrine function.

X. *The Functions of Some Peripheral Nerves*

As a result of the introduction of suitable electrical contrivances, various nerves were excited in a study of their pos-

sible function. I shall list here only a few of the brilliant discoveries which were made. I fear that even this recital will interest only the sophisticated listener.

In 1845 the Weber brothers discovered that stimulation of the vagus nerve causes a slowing or a complete standstill of the heart; in 1851-1852 Claude Bernard and Brown-Séquard discovered that under nervous influence blood vessels might contract and thus diminish the rate and amount of blood flowing through the organ; in 1866, Carl Ludwig discovered that other nerves also supplying blood vessels might influence the latter to dilate; the same Ludwig with v. Cyon discovered that stimulation of a sensory nerve arising in the aorta caused a reflex slowing of the heart and a profound drop in the blood pressure and that certain other nerves going to the heart caused on stimulation an acceleration in the beat of that organ. About this time also Ludwig discovered the secretory nerves supplying the salivary glands. That the vagus nerve exercised a possible motor and secretory function on the stomach was foreshadowed by Phillips in 1836; Pawlow established the fact (about 1894). As late as 1923, Hering pointed out the importance of the carotid sinus in the automatic regulation of the blood pressure and its effect on other physiological activities of the body.

May I assure you that these do not constitute isolated facts comparable to the snow flakes of a winter's blizzard. *Most* of them already fit admirably into the scheme of things (established by experimentation) and that the knowledge of them has been of great practical significance in modern therapy. Further experimentation will reveal the biologic and practical significance of the others.

XI. *Conclusion*

In this connection, may I, in conclusion quote from the great Claude Bernard. In his "Introduction to the Study of Experimental Medicine" Claude Bernard writes: "By simply noting facts, we can never succeed in establishing a science. Pile up facts or observations as we may, we shall be none the wiser." But the next sentences, equally true and significant, read as follows: "To learn, we must necessarily reason about what we have observed, compare the facts and

judge them by *other facts used as controls.** *But one observation may serve as control for another observation, so that a science of observation is simply a science made up of observations, i .e., a science in which we reason about facts observed in their natural state, as we have already defined them. An experimental science, or science of experimentation, is a science made up of experiments, i. e., one in which we reason on experimental facts found in conditions created and determined by the experimenter himself."** Physiology has always proceded along these lines. Facts established by rigorous observation and experimentation must necessarily precede intelligent and intellectual cogitation. Without facts, established by observation, pure ideation on what is known or on what might be will result in barren scholasticism such as we had in the Middle Ages.

* Italics my own.

Charles D. Stewart writing in the "Atlantic Monthly" (July, 1935, p. 114) puts it very well when he writes:

"Thoreau had the faculty, which Burroughs does not seem to admire or understand, of the modern *researcher.** It consists of faith in facts. There is no such thing as an unimportant fact. Its significance may depend upon how it fits in with other facts; but you have to get your facts first. Therefore science does look askance at any truth or ask it what excuse it has for being. It lays hold of facts on all sides and knows that eventually something will come of them." I am sure that every really well intentioned scientist will subscribe to these statements.

The Pharmacist
The Key to Better Public Relations*

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Have you ever stopped to ask yourself why you are studying pharmacy? If you have not done so already, do it now. Why are you?

* A lecture delivered before the students of the School of Pharmacy of Temple University, Philadelphia, March 22, 1945.

Are you looking on pharmacy as a means of making an easy living? There are less tedious ways of making money. Are you seeking prestige? Other skills can lead you to more spectacular honors. What, then, may be your fundamental reasons for choosing pharmacy as a career?

Pharmacy performs a unique and vital function in our culture. It is a function that, unfortunately, has been misunderstood and misinterpreted, even by many of its practitioners. Unless that function is clarified, understood, and widely appreciated, there is grave danger that the practice of pharmacy will pass out of the hands of those who are now its custodians.

For the purposes of our considerations here today, I shall divide the subject of pharmacy into pharmacy as it is practiced in the drug store, on one hand, and pharmacy as it is practiced in laboratories, manufacturing establishments, and by detail men, on the other. We need to make this distinction. There is not sufficient understanding of these various functions. They are confused in many minds and considered only inclusively because the background and the training are similar up to a given point; however, in actual practice, the functions of the pharmacists in these various settings are very different.

How the Pharmacist-Druggist Thinks of Himself

For good and interesting reasons the pharmacist-druggist has developed an erroneous and unfavorable opinion of himself and of his function in our society. To a great extent, he has regarded himself as being trained for one function, as required by law, and then actually practicing another function when placed in his later surroundings. He has regarded himself as being trained as a professional man, as a chemist and a botanist, but forced to practice as a retail merchandiser. He has thought himself trained as a pharmacist, and then required to become a business man in order to survive.

He has thought of these two facets of his function as separate and inharmonious. He has thought that his role as a business man would somehow endanger his standing as a pharmacist. As a result, he has found himself a man divided; a man with blurred ideas of his own objectives; and a man confused about his place in our culture.

The retail drug store has been painted very bright at one extreme and very dark at the other by two separate groups. There are those who argue that unless the retail druggist concentrates on the prescription, pharmaceutical, and medical end of his business, he runs the risk of increased competition from clinics, hospitals, dispensing doctors, industrial medical centers, and various new forms that may be developed for the distribution of such products. There is an opposing group consisting of those who argue that unless the pharmacist-druggist does a better job of merchandising all the items in his store, and stops over-emphasizing the prescription department, he will not survive. One side threatens him with dire consequences if he is anything else than a professional man; the other contends that the professional man cannot survive unless he becomes a merchant as well.

Neither of these viewpoints grapples with the total reality. The pharmacy, or drug store, is neither a holy temple nor a shoddy market place. It is a definite part of our culture and it serves a definite and specific function in our society.

What is that function? What are the values of that function?

What Information Is Necessary to Define His Function

One thing is clear; the function of the pharmacist-druggist is not so simple as some of those who would have us adopt their viewpoint would like to believe. To reach wide agreement, it would be necessary to make a thorough and unbiased study of the retail drug store and of pharmacist-druggists. Such questions as these are crying for answers:

> What are the direct and material functions of the drug store, such as goods supplied, frequency of contacts by various members in the community?
>
> What alternatives does the consumer have in buying? Who are the competitors of the pharmacist-druggist?
>
> What are the social functions of the drug store in various types of communities?
>
> What are the inter-personal relationships between the druggist and his associates and the community?
>
> What are the attitudes of the people in the retail drug industry, on one hand, and the esteem, confidence, and prestige in which it is held by the community, on the other?
>
> To what extent does the community look to the druggist for personal guidance and counsel, and to what extent does it accept his personal services and recommendations?

What do the people expect of their pharmacist-druggist and of the drug store; what are the trends in this regard, and what suggestions will make the retail drug store a more effective and productive institution?

This would be only a beginning, however. To make sound decisions and to make wise plans, it is also necessary to know how the retail drug industry fits into the functions of wholesalers and of manufacturers. It is equally important to know considerably more about what goes on in various kinds of drug stores in various types of communities. A detailed analysis should be made of the personnel and of all the human factors that operate in the retail drug field.

With a rich body of data available, considerable clarity can be achieved in this area. Where today we have disagreement and emotional arguments, we could substitute facts and a realistic framework for effective planning and decision-making.

Five Factors Contribute to His Total Function

Since we lack such a body of data, let us at least consider some of the factors that are quite evident:

First of all, in our society the pharmacist, if he is sincere and honest with himself, caters primarily to the health and well-being of the community he serves. If he is effective to his greatest degree, his principal emphasis is on the operation of a health center. That is the primary objective he sets up for himself and toward which he strives constantly.

Second, because of the prestige and respectability of the health center, it has served over the years as a meeting place for the people of the community. It has been a place where the young people, particularly, could gather without fear of criticism by their parents or by their elders.

Third, the drug store has been the place where those in need of counsel have found it convenient to go. The pharmacist-druggist has been a friend and guide for many people on a great variety of problems.

Fourth, the drug store remains open seven days a week and many hours a day. For this basic reason, the pharmacist-druggist finds himself operating a convenience center for a great variety of goods.

Fifth, inasmuch as he cannot stay in business unless he continues to attract members of the community, and unless he makes a profit on his operations, the pharmacist finds himself operating a business unit in the form of a drug store, whether he likes this or not.

In brief, the pharmacist-druggist operates a health center, a meeting place, a place where certain counsel is given, a

center for convenience goods, and a business unit. It is not a question of which functions he can embrace and which ones he can eliminate. They are all parts of the total reality. Remove one and the total function of the pharmacist-druggist is impaired and his value is decreased. Of course, there are exceptions, but I am speaking of the rule. This, then, is the job description of the pharmacist-druggist in our society.

What Sort of Man Is the Pharmacist-Druggist?

What men carry on this complex function most skilfully? Here again, it is dangerous to over-simplify. But perhaps we can start putting together some clues by considering three pharmacist-druggists who are in business today.

One of these men I should put down as a rarity of our generation—he is a completely honest man. He is honest with himself and honest with those whom he contacts. More accurately, perhaps, I should say that he is a man of great integrity. He realizes that health and well-being are deep and serious matters to all those who come into his store. So he has deliberately, with great skill and good taste, dramatized the medical section of his store. He is always immaculately dressed, and his store reflects the respect he has not only for those who deal with him, but respect for himself as well. He knows people and likes them. He has become skilled in dealing with people and carefully trains all his associates. He is one of the most completely happy men I know. And he makes money; his net profit is in five figures.

I have put off until the last one of the most important things that underlies his achievements and his well-being. He is one of the best informed pharmacists I have ever known. Without this, he would be a far lesser man and a much smaller success.

But that does not prevent him from operating with equal integrity one of the finest cosmetic departments in his community. It does not prevent him from displaying and merchandising soap, candy, stationery, and tobacco. Do the people in the community respect him any less for these activities? Judging from the people coming into his store, and passing competitive places on the way, I should say, "No".

It happens that this particular pharmacist-druggist does not operate a soda fountain. But I am thinking about an-

other druggist in another community; he not only carries on a retail drug business that gains him the respect of the community, but also the enthusiastic cooperation of the town's doctors. Yet he operates a soda fountain in the same place of business. But there is this difference; he makes sodas and sundaes that have a priceless ingredient—a combination of integrity and imagination. His sandwiches are a delight to the palate and a gratification of hunger in a grand manner. In short, this man operates a soda fountain that is a credit to his profession.

For contrast, let us consider a third young man. He claims he is interested in people. Yet if he were honest with himself, he would admit that to him pharmacy is a job. Even though he owns his own store, he always has a sense of frustration, of waiting for something better to happen, of something better to happen, of something more gratifying to come along. He would be shocked if I confronted him with this analysis of his frame of mind, yet I could point to scores of evidences that would disclose the narrow, circumscribed objectives that hem him in. You can see it in every inch of his place of business. You can also see it in the constant rotation of sales people and helpers who list his name when they are filling out job applications with others.

Distribution is mainly a matter of inter-personal relationships, and yet this particular man not only does not understand people, he does not understand himself. Store operations are a matter of helping others to make up their minds and of creating an atmosphere that communicates respect, cleanliness, and convenience, yet the dim lighting, the messy counters, the dingy prescription room, and the spotted cases breed exactly the opposite impressions. He would tell you that his words were misunderstood if you pointed out how he irritated the most recent customer by his lack of interest. The impatience in his voice confused the puzzled woman who asked whether he "couldn't please put up the prescription right away" instead of requiring her to come back in fifteen minutes, and I doubt that she will think of him first when she has another prescription to fill.

These are isolated instances, but for me they illustrate the fact that respect and dignity start with the man as a human being, not as a pharmacist-druggist. Unless you can respect

yourself in carrying on the complex functions of a retail druggist, then you will wish idly for the rest of your life and never gain the respect of others. Unless you have the aptitude, the interest, and the inclination to make the retail practice of pharmacy the source of deep gratification and well-being, the money profits you make will be small compensation, regardless how great they may be.

Pharmacy and Business

It has been most unfortunate that somewhere in the past a false tradition has grown up in pharmacy. The notion is held by many that pharmacy is noble and that business is not; that pharmacy at its best should be a profession, and that business is less than a profession; and that when pharmacy and business are mixed, pharmacy suffers.

Regardless of how widely this attitude is held, it bears examination. We lack the time here to analyze the reasonableness or unreality of this notion, so we may have to settle for a few dogmatic statements.

Our way of life, the great tradition of freedom that was given its lusty breath of life on this continent, may disappear unless we can understand its fundamentals. It has been made possible because there have been many people in our society making the important decisions. And because a great many people have been making the important decisions within that framework, the individual has had the opportunity to make his own decisions and choices in his search for the good life.

The Pharmacist Contributes to Freedom

However, we must keep in mind that even in the United States freedom did not become the common experience until the industrialization of the nation became well advanced. As specialization increased, the domination of one person by another, of one group by another, became more and more difficult. Consequently, each person had an increasing degree of self-determination and opportunity for self-realization. In other words, in our business state we have had an ecnomic basis for freedom, for a continuity of the factors that make for free choice.

The mere fact that freedom has existed here during the past hundred and fifty years is no guarantee that it will continue, however. The growth of situations that place the decision process into fewer and fewer minds, the decadence of skill that permits integration of specialists voluntarily, the apathy and indifference of the people toward their responsibilities—all such influences can destroy the basis of freedom.

In our culture, if we are to continue our freedom, we must keep business dynamic. It cannot be permitted to become static or reactionary without endangering its very existence. And its growth and direction must always be in terms of the common good of all the people.

How the Pharmacist-Druggist Contributes to Freedom

What has that to do with the pharmacist-druggist? A great deal. With this background in mind, the successful operation of a drug store becomes fully as necessary to our economy as the skilful preparation of a prescription is to the health of an individual. When the opportunity to open a small business, such as a drug store, vanishes, we shall no longer have the freedom of choice that makes the individual supreme. This should give pause to those in the industry who would divorce pharmacy and business completely. The two, as we know them today, are inseparable. And unless we can make a profession of business, we shall not have the opportunity of maintaining a profession of pharmacy as we know it.

There is nothing about the business of running a drug store, even with its complex objectives, that makes it unworthy of your best talents and efforts. If you are successful as a business man and also successful as a pharmacist, you can say proudly that you have performed the complete task with skill and not merely a part of it. Skill in inter-personal relations, skill in helping people make decisions that affect their health and their respect for themselves, skill in helping others toward the good life—all these are as meaningful and vital as skill in compounding prescriptions.

As you can guess, I have no patience with people whose own sense of inferiority makes them apologists for business. I have even less patience with those who labor under the illusion here in the United States that by driving a wedge be-

tween business and the other elements in our culture, they can achieve Utopia. Even in the troubled world of today, we have all the elements of a greatness that surpasses the past if we can only learn to direct our efforts toward a rich, meaningful, and good life for all our people and not merely for a chosen few or a limited number of selected groups in our society. And unless you, as pharmacist-druggists, can add your part to this realization, you must recognize that the drift toward some other way of life is inevitable.

Thus far, I have tried to make clear to you that unless you, as human beings, can make pharmacy serve the community in its best interests, and unless you can operate drug stores as successful businesses, you will not be discharging your full responsibilities to your heritage. Now I am going to discuss a third point; it has to do with skill in pharmacy.

Pharmacy as the Druggist's Basic Skill

Undoubtedly, I can make my point clearer by telling you about another pharmacist-druggist. He is a young man, only a few years out of college. From what little I have seen of him, I will wager that he will have a great success and a satisfying one.

He recognized early in his career that if he hoped to be a successful pharmacist, he would first have to become a skilful one. He also recognized that the common failing of education in America has been the tendency to abandon intellectual inquiry once a diploma is framed and hung on the wall. To him, education for pharmacy became a constant search for truth and competence within the range of his interests. He decided that, diploma or none, he would become the most skilful pharmacist, not only in his community, but in his section of the country. Realizing that only about 25 per cent of the prescriptions brought into his store required compounding, he decided to become completely familiar with as many pharmaceutical specialists as he possibly could. Today, most of the doctors in his community call him for information; competing druggists call him when they are unfamiliar with new products. There is no question in anybody's mind about his competence in conducting the finest kind of health center.

If you plan to become a pharmacist-druggist, make up your mind to be a skilful pharmacist first of all. Look on your

training and discipline here as a starting point for a lifetime of inquiry. Since pharmacy is the foundation of a drug store, make it a permanently solid one, and you can construct on it a structure that will be worthy of your greatest hopes.

However, do not channel your skills too narrowly. Learn also to live deeply and meaningfully so that you can help others achieve the same obectives. That is as necessary in catering to the minds of others as it is in keeping their bodies well and strong. Do not become so deeply immersed in pharmacy and in business that you lose your perspective on the greater world about you.

We have talked about the pharmacist as a human being, as a business man, and as a skilled specialist. There is a fourth aspect that should have our attention here today—that is, the pharmacist as a director of human relations.

The Need for Meaningful Inter-Personal Relationships

We realize that with peace our major problems will be problems of distribution. As I have mentioned previously, distribution is concerned primarily with inter-personal relations. In distribution, no goods are manufactured; they are merely changed in time and place. In this manner, their utility is increased. In this movement of goods toward consumption, mainly people are involved.

Some of the factors that enter into moving goods toward people, and in helping people make choices, are generally known as merchandising. However, much more needs to be known before we can say that we have done more than scratch the surface of this problem, and I am confident that an increasing number of manufacturers and wholesalers will apply themselves to it. But an increasing number of pharmacists should also give this opportunity lasting and systematic attention as well.

The pharmacist-druggist, in common with many of the factors involved in distribution, should make himself familiar with at least the simple fundamentals of the things that liberate the interests and the energies of people, and the things that tend to frustrate them. Here is an area in which we, in common with the rest of the world, are woefully lacking. However, even with the sketchy knowledge available to us,

we should be more skilful in our dealings with others than we are today. Unless we can increase our skills in this area, many of our efforts in other directions will be in vain.

The Need for Better Selected and Trained People

There is an area of inter-personal relationships within the drug store where we need an even greater amount of information. I am referring to the selection and training of managers and sales people. The retail field is one of the few remaining fields where practically nothing is known about the kind of people who make the most skilful associates, and next to nothing about how best to train them. Even before this body of data is accumulated, the pharmacist-druggist can increase his own effectiveness by looking objectively on his own experiences and by sharing his experiences with those who find themselves in similar situations.

For example, how many druggists do you know who have the foresight after hiring an assistant to make clear exactly what kind of impression they wish to make on every person who comes into their places of business? I know only one. Every sales person this man hires is told exactly how to treat people who come into the store. He stresses the fact that when people come in they either have a problem or are seeking some form of gratification. Therefore, they are to be treated seriously and respectfully, but graciously.

How One Pharmacist-Druggist Does It

"I want to make sure," he told me, "that everybody who comes into my place of business, even for the first time, leaves with a definite impression that we are dependable, that we know our business, that we are interested in his health and welfare, and that we want him to come back. Everything I have ever done since I opened this store is aimed at that impression. I explain to my people that they can show these things in the way they greet a customer, in the way they handle the goods, in the way they wrap packages. I take no chances that my people will pick up these things by themselves. I spend several days, even weeks, driving these points home. And if I ever see one of my people make a mistake, I correct it nicely right after it happens. In that way we all

benefit. Then, to make it fair, they have the privilege of setting me straight when they catch me violating my own principles."

In our complex distributive structure, no one unit is self-sufficient. Yet I have seen pharmacist-druggists blindly regard wholesalers and manufacturers as opponents rather than as integral parts of their total scheme of things. By integrating the efforts of wholesalers and manufacturers with your own efforts, the opportunities for creating a more effective and effortless flow of goods through to the consumers are beyond imagination.

We could go on discussing the possibilities in skilful interpersonal relations, but these must suffice for the present. However, success in this direction, just as success in the other areas, will not come automatically merely because you wish to make it come true. You must plan for it and work for it.

The Fundamental Methods of Public Relations

I have avoided, up to this moment, even a mention of public relations. I have done it purposely. It is unfortunate that the practice of public relations is too often associated with publicity, with a few simple formulas, and with superficial methods. The truth is that no methods, no matter how complex, can make up for lack of integrity. No formulas of interpersonal relationships can compensate for insincerity in carrying on a business function. No tested phrases, no selling sentences, can fill the void that is left when a lack of skill in a chosen profession causes discomfort, or even death. No smiling grimaces, or practiced gestures, can subtitute for a genuine interest in helping others find a good life.

Live up to the kind of person that has been suggested here today, and your public relations will be far better than they can possibly be if you fail to measure up. Become this kind of person and you will never be at a loss for words, or gestures, or responses, to convey to others what you want them to know and believe about you.

Concerning Other Skills in Pharmacy

Thus far we have dealt only with the pharmacist-druggist. Not all of you will work in drug stores or operate them. To those who will find their greatest gratifications in laboratories,

in doing liaison work between manufacturers and doctors, or in carrying on the many opportunities open to people trained in pharmacy, I have only one suggestion that I can develop in the limited time left. Whatever phase of the world's work you elect as your sphere, make up your mind to do it thoroughly, skilfully, and with integrity. In your relations with others, nothing will speak so loudly for you as your ability and interest in doing your work as well as you possibly can.

Likewise, always be determined to improve your skills and your abilities. We are living in a skill age. Just getting by will not be enough in the future, because we can no longer hope for the accidentals of being in the right place at the right time. We must earn our way to the top, if being at the top is our ambition.

In addition to your own interests, however, respect the interests of those with whom you are associated. Likewise, respect the common good of all people.

Do these things, encourage enough people to do likewise, and you will never see a lack of opportunity in your time. Neither will you lack security. Nor will there be a sword of doom hanging constantly over your head.

Do these things, sharpen your skills in dealing with others, and you, too, will have no need to worry about your public relations. They will be a natural by-product of your normal life and normal being.

Post War Jobs for Pharmacists

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Pharmacy is defined as the art of compounding, dispensing and selling of drugs. This definition should be augmented to include the word manufacture. For with the advancement of the scientific and production end of the profession, the educational end has lost pace and has somewhat dragged behind the rapidly moving industries.

Pharmacy graduates have been trained to fulfill the compounding, dispensing, and retail selling phase of the profession but are woefully weak and unprepared to cope with the

production end of a pharmaceutical manufacturing firm. With the almost complete and absolute utilization of machinery and the elimination of hand work, the need for mechanically-minded pharmacists is tremendous.

To the best of my knowledge the vast majority of operational jobs in the pharmacy industry are held by self-trained "skilled" labor, not by college trained "professional" labor. In the preparation of pharmacists for industrial manufacturing, a new rich vein of jobs might be tapped. To cite, in particular, just one of many phases of the vast pharmaceutical industry is the point of this discussion, since the writer's experience in pharmaceutical manufacturing is limited to tablet production.

We point out with justifiable pride how much the pharmacist contributed to science in the field of alkaloidal chemistry; but can we point out with the same pride what pharmacists have contributed to the discovery and production of the sulfadrugs and penicillin?

The allied profession of chemistry, a child of the older profession of pharmacy, has developed the chemical engineer to cope with the industrial development. Why could not we train operational pharmaceutical engineers to enter into the vast pharmacy industry? The design and plan of equipment is well handled by the chemical engineering profession. The pharmaceutical profession should be prepared to take over the operation end. Since mechanical, large scale production has supplanted the manufacture of pharmaceuticals in the drug store, so then should the pharmacist be prepared to carry on in the manufacturing plant. In the same way that a well-trained pharmacist could make a better tincture and probably improve on the process in the prescription room of a drug store, he can operate and improve the equipment now used in industry. With the thorough theoretical and technical training our pharmacy students now receive they can be easily channeled into production with some training in operation of equipment. A graduate-pharmacist operator would be a most desirable asset to industry. An operator who understands all of the theoretical aspects of the ingredients used in the process and in addition, actually operates the production equpment, would be in an excellent position to make suggestions for greater efficiency.

Why not produce a "professional" laborer? One who is

trained both theoretically as well as practically. This is not meant to disparage the great number of fine production men in industry but to present the possibility of preparing men who might be even better.

In the tablet industry trained pharmacists in the granulation, compression, and coating departments would be greatly in demand. The enormous possibilities can be increased many fold by applying the same trend of thought to other branches of the pharmaceutical industry. Why not produce men in our colleges of pharmacy who will stand in those enormous payroll lines of one of the nation's largest industries? Far too many employees of the pharmaceutical manufacturing industry are not products of pharmacy schools. Colleges of pharmacy would not have to turn to industry for financial aid, since the increased enrollments would make every pharmacy college financially independent.

In the small tablet concern that I know of there are about twenty people on the payroll. Of these, two "professionals" are graduates of pharmacy colleges and of the other eighteen about fourteen hold jobs that would be classified from semi-technical to extremely technical. Those who hold the extremely technical positions in the granulating, compressing, and coating departments are on a salary schedule almost comparable to the two "professional" employees. In my opinion, this would be found to be true in the majority of plants all over the country, for production jobs are paying more than professional jobs in contrast to the educational demands each position requires.

The granulating department where thousands of dollars of drugs are processed daily is under the supervision of a capable, well-trained man, who had just a high school education. His job paid as much or more than the average registered pharmacist anywhere in the country receives. The manager never thought of hiring graduate pharmacists to work in the granulating department. It just never occurred to him. Why couldn't he be educated to hire men who have been trained in college? The same situation existed in the coating and compression departments. The supervisors were good men who had risen through the ranks. Whatever knowledge of pharmacy they possessed was obtained from the constant use of drugs and chemicals. How much they could have elevated themselves and aided the company with a good, sound phar-

maceutical training is unknown. But it is known that they could have progressed much further had they had this knowledge. Frequently, they had minor problems which were presented to the analytical department. The solution of the problem presented by the analytical department may present production problems. These could be eliminated to a great extent by training men in pharmacy schools to hold these production jobs.

The training of pharmaceutical engineers is particularly applicable to the returning veterans. The ultra-mechanically minded young men of the tank and air corps would probably be vitally interested in a course of this nature. A four or a five year course of study leading to a bachelor of science in pharmaceutical engineering could be designed that would satisfy the most mechanically minded person. Modifications of this training might be worked out that would enable the colleges of pharmacy in this country to attract more veterans than they would if they had only a minimum four year course of study to offer.

For a number of reasons, I believe that many of the veterans will not care to study four or five years after returning from the war. Many of these veterans who left as youngsters will return much older than their years and will not care to associate with the usual college student. Many will not be able to acclimate themselves to the classroom for too great a length of time. Others will be in a hurry to train and get out into the world. Still others will not be able to go to school for a great length of time because of their dependents. It is our duty to provide training for these men. We should try to induce the best of them to enter pharmacy. The trend towards practical education will be completely precipitated by the return of the veterans.

The manual arts field will attract a great number of these boys because of the practical nature of the work and the fact that the training period is brief in comparison to collegiate work. Wood working, air conditioning, radio, and electricity will attract a number of men whom we should have in our profession. I do not mean that accelerated courses of study should be offered, for we have already found that to maintain the high standards that have been set forth, acceleration must be eliminated. I mean, the tendering of courses of study of various lengths of time.

The operation of pharmaceutical equipment courses can be introduced to run from one year to five years. Certificates for various degrees of efficiency and for the scope of equipment training might be presented to those who decide to train for one, two, or three years. For those who train four or five years, the usual bachelor's degree can be awarded.

A complete course of study can be prepared for a trained tablet man stressing the practical aspects and introducing the theoretical aspects in one year's time. In two years the same individual could be trained in ampul manufacture and provided with an even greater theoretical background. In three years, train a man for the above and also how to handle stills, reactors, presses, and other pieces of mechanical equipment. Thus we would be producing a high class "professional" laborer who will not be a mere mechanical robot.

Courses of study for the incapacitated might receive some attention from our pharmaceutical educators. We owe it to those who are physically handicapped to provide for them means of livelihood. Let us not leave it up to the other fellow. By pooling our thoughts we should be able to train those who lost their limbs for any number of jobs in our profession. Tablet moulding and clerical pharmaceutical positions in a large drug house are just two of many possibilities that can be advanced.

The sales sections of pharmaceutical companies have been making the biggest inroads in our trained retail men. That is, they are taking many valuable and experienced men and offering them better opportunities than the retail drug store. Courses can be made available for specifically this type of training. Men can specialize in a semi-technical and semi-business course which will equip them to join the sales staffs of the various pharmaceutical concerns.

Our chemical brethren have been training women for library service. They have acknowledged that the realm of the chemist extends beyond the test tube. The technical-librarian has become a valuable instrument in the research divisions of many companies. They offer valuable services to the busy chemist who can spend his time to greater advantage. Pharmacy schools can prepare students along the same lines. Courses in library science can be incorporated in a regular course of study at the expense of some of the cultural courses.

Women can also be trained to prepare for technical office jobs. Being adept in the field of stenography they can become doubly useful in a technical firm's office by keeping a perpetual inventory, preparing manufacturing tickets that are to be processed, and doing the many special tasks in this field.

In a concern that I am familiar with the women of the office staff make out the manufacturing process tickets, enter incoming items in the inventory file, and deduct those items used daily in production, this in addition to the regular routine office duties. The first two aforementioned duties are excellent positions for stenographic pharmacists. In purchasing drugs and chemicals from different concerns, one may purchase the same item under any one of three-four different synonyms. For example, one concern may sell an item under the name couch grass, another dog grass, and still a third under the name triticum. A young woman who has been trained in stenographic and office machine work in conjunction with pharmacy would make an excellent technical office assistant.

Experience along these lines would enable courses of study to be offered that would enable graduates of pharmacy school to take over in the pharmaceutical manufacturing industry as they took over the retail profession. Pharmacists will be able to point out with pride that the products they sell are not only made under the supervision of pharmacists but actually made by pharmacists.

It is frequently heard that pharmacists are a "drug" on the market. If this is true, it is only because more fields of endeavor have not been made available. When a manufacturer markets an item and its sales reach what apparently seems a peak, he either does one or two things. He either tries to create new fields for his product or he introduces a new product to increase his volume. The same principle applies to pharmacy schools. Rather than try to eliminate the excess by making the requirements more difficult, that same effort is best expended in creating new fields and introducing new pharmacists. The policy of plowing under to make a surplus commodity scarce and more valuable has been exploded. Maintenance of high standards is essential. Keeping the course of study on a par with other allied professions is also a necessity. But even these requirements are not the answer to the elevation of the profession of pharmacy. The writer believes the answer lies in a broadened profession; a more remunera-

tive profession, and one which offers a far most vast list of employment possibilities than heretofore. With the establishment of these cardinal points, the maintenance of the standards and the elevation of the profession in general will come closer to being a reality than ever before.

Let us not have products merely made under the supervision of a pharmacist—let us have the products made by pharmacists. True, these production jobs are not white collar jobs but then neither is a chemical engineer's job in an Oklahoma oil field.

It all simmers down to the fact that we must find more fields of endeavor and we do not have to look too far to find them. For they are right in our vast pharmaceutical manufacturing concerns. It must be our goal to educate the manufacturer to hire pharmacists for production roles and in turn to supply the men to fill these jobs.

Report on Need for Graduate Work in Pharmaceutical Subjects Prepared for the American Foundation for Pharmaceutical Education by Dr. A. G. DuMez, Secretary of the American Council on Pharmaceutical Education, Received May 14, 1945*

The following is a report on the needs for graduate work in pharmaceutical subjects as revealed by the information supplied in response to the questionnaire sent out March 26, 1945.

*Dean DuMez wishes it to be made clear that it is impossible to make a report of this kind which will be accurate in all details. There are too many indeterminate factors to reckon with. For instance, it is impossible to foretell how many faculty members will change their occupation or will decide to retire before they reach retirement age. Furthermore, we do not know how attractive teaching will be as compared with work in commercial and other fields in the future. Therefore, the figures given in the report must be looked upon as estimates made for the purpose of giving us some idea of the task which lies before us in training personnel for our faculties. If there are mistakes in the report, the responsibility lies with the colleges because he accepted the figures which they gave him at their face value and has merely correlated and summarized them so that they will present a picture of the whole.—Editor.

Scope of Questionnaire

Only data indicative of the need for graduate study in the following fields: pharmaceutical botany and pharmacognosy, pharmaceutical chemistry, pharmacology and pharmacy, were requested in the questionnaire sent to the colleges, because it was believed that teachers and research workers in other fields would do their graduate work in the institutions specializing in these other fields.

Number of Colleges Supplying Information

There are at present 68 schools and colleges of pharmacy in this country offering a four year course in pharmacy. Of this number, 65 have been accredited. Sixty of the latter supplied the data upon which this report is based.

Student Enrollment

In the five year period preceding our entry into the war, the average annual enrollment in the 65 colleges of pharmacy was roughly 8,500 students. On December 1, 1944, 59 of the accredited colleges of pharmacy reported a total enrollment of 3,384. Of this number, 85 were graduate students (71 men and 14 women).

Retirement Age of Faculty Members

Of the 60 colleges which supplied information, 38 reported that they had in operation a retirement system for faculty members and 22 reported that they had made no provisions for retirement. Of the 38 colleges which have a retirement system in operation, 1 reported that retirement is permissible at age 55; 10 at age 60; 21 at age 65; 1 at age 69; and 2 at age 70.

The compulsory retirement age was given as follows: 1 at 64 years; 7 at 65 years; 4 at 68 years and 26 at 70 years.

Ages of Present Deans and Directors

Of the 60 deans and directors reporting, 11 are above 60 years of age; 19 between 55 and 60; 9 between 50 and 55; and 21 are between 34 and 50.

Ages of Faculty Members Other Than Deans and Directors

The following are the numbers for each rank of faculty members now 60 years of age or over: Professors—68; Associate Profesors—7; Assistant Professors—5; Instructors—9.

Highest Academic Degrees Held by Deans and Directors

Degree	Number Holding Degree	Degree	Number Holding Degree
Ph. D.	23	M. B. A.	1
Sc. D.	1	Ph. M.	1
J. S. D.	1	B. S.	2
M. D.	3	Phar. D.	3
D. V. M.	1	Ph. C.	5
M. S.	17	Ph. G.	2

Highest Degrees Held by Members of Teaching Faculties

Professors: Of a total of 227 professors, 134 hold the degree of Doctor of Philosophy, 55 hold the degree of Master of Science, 15 hold the degree of Bachelor of Science, and 23 hold lesser degrees.

Associate Professors: Of a total of 82 associate professors, 51 hold the degree of Doctor of Philosophy, 22 hold the degree of Master of Science, 6 hold the degree of Bachelor of Science and 3 hold lesser degrees.

Assistant Professors: Of a total of 124 assistant professors, 64 hold the degree of Doctor of Philosophy, 41 hold the degree of Master of Science, 17 hold the degree of Bachelor of Science, and 2 hold lesser degrees.

Instructors: Of a total of 131 instructors, 20 hold the degree of Doctor of Philosophy, 43 hold the degree of Master of Science, 51 hold the degree of Bachelor of Science and 17 hold lesser degrees.

Assistants: Of a total of 94 assistants, 1 has the degree of Doctor of Philosophy, 5 have the degree of Master of Science, 51 have the degree of Bachelor of Science, and 8 have lesser degrees.

The foregoing data show that there are 10 deans, 23 professors, 3 associate professors, 2 assistant professors and 17 instructors holding degrees of lesser value than the bacca-

laureate degree. The American Council on Pharmaceutical Education requires that all teachers above the rank of assistant should have completed one or more years of graduate study in a recognized graduate school. These faculty members should, therefore, be replaced as rapidly as qualified replacements can be obtained.

Replacement Requirements for Next Ten Years

The following tables give in detail the requirements for replacements over the next ten years of deans, directors and faculty members teaching courses in the fields enumerated under Scope.

Table 1.
Replacements and Additions Required for Deans and Directors

	Total at pre-war level	Total at present level	No. died or resigned and not replaced	No. on leave for duration	No. of replacements required	No. expected to be added after end of war	Total replacements and additions
Dean or Director	65	63	2	1	2	1*	3

The figures given in the second column of the table for the number of deans and directors at the present level include 11 who are over 60 years of age, and all of whom may be expected to retire within the next ten years, plus 7 who are over 55 years of age and who will also retire within the next ten years, because of compulsory retirement at age 65.

*Dean for the college of pharmacy recently established in the University of New Mexico.

Table 2.

Replacements and Additions Required in Pharmaceutical Botany and Pharmacognosy

Rank	Total at pre-war level	Total at present level	No. died or resigned and not replaced	No. on leave for duration	No. of replacements required	No. expected to be added after end of war	Total replacements and additions
Professors	47	43	4	3	4	5	9
Associate Profs.	15	10	4	1	5	0	5
Assistant Profs.	22	25	0	4	0	2	2
Instructors	31	21	3	4	10	9	19
Assistants	24	17	4	0	7	14	21
Teaching Fellows	7	1	3	0	6	2	8
Research Fellows	3	0	2	0	3	0	3

The figures given in second column of the table for the numbers employed at the present level include the following numbers of faculty members who are over 60 years of age and who will have to be replaced within the next ten years: 10 professors, 1 assistant professor and 3 instructors. These numbers should therefore be added to those in column 5 to obtain the total replacements required over the next ten year period.

Table 3.

Replacements and Additions Required in Pharmaceutical Chemistry

Rank	Total at pre-war level	Total at present level	No. died or resigned and not replaced	No. on leave for duration	No. of replacements required	No. expected to be added after end of war	Total replacements and additions
Professors	73	69	4	4	4	5	9
Associate Profs.	33	33	1	3	0	3	3
Assistant Profs.	41	40	7	7	1	9	10
Instructors	47	34	4	3	13	11	24
Assistants	47	32	16	5	15	21	36
Teaching Fellows	22	8	3	2	14	4	18
Research Fellows	8	9	4	0	0	13	13

The figures given in the second column of the table for the numbers employed at the present level include the following numbers of faculty members who are over 60 years of age and who will have to be replaced within the next ten years: 24 professors, 3 associate professors and 2 assistant professors. These numbers should therefore be added to those in column 5 to obtain the total replacements required over the next ten-year period.

Table 4.
Replacements and Additions Required in Pharmacology

Rank	Total at pre-war level	Total at present level	No. died or resigned and not replaced	No. on leave for duration	No. of replacements required	No. expected to be added after end of war	Total replacements and additions
Professors	47	41	11	0	6	13	19
Associate Profs.	11	12	1	3	0	2	2
Assistant Profs.	14	20	0	4	0	2	2
Instructors	26	17	2	2	9	2	11
Assistants	20	15	1	0	5	0	5
Teaching Fellows	3	0	0	0	3	0	3
Research Fellows	2	7	0	0	0	0	0

The figures given in the second column of the table for the numbers employed at the present level include the following numbers of faculty members who are over 60 years of age and who will have to be replaced within the next ten years: 13 professors, 2 associate professors, 2 assistant professors and 2 instructors. These numbers should therefore be added to those in column 5 to obtain the total replacements required over the next ten-year period.

Table 5.
Replacements and Additions Required in Pharmacy

Rank	Total at pre-war level	Total at present level	No. died or resigned and not replaced	No. on leave for duration	No. of replacements required	No. expected to be added after end of war	Total replacements and additions
Professors	62	56	6	4	6	3	9
Associate Profs.	24	24	3	0	0	3	3
Assistant Profs.	40	30	6	4	10	14	24
Instructors	57	44	10	5	13	13	26
Assistants	50	30	17	8	20	16	36
Teaching Fellows	7	1	3	0	6	4	10
Research Fellows	5	5	0	0	0	4	4

The figures given in the second column of the table for the numbers employed at the present level include the following numbers of faculty members who are over 60 years of age and who will have to be replaced within the next ten years: 21 professors, 2 associate professors and 4 instructors. These numbers should therefore be added to those in column 5 to obtain the total replacements required over the next ten-year period.

Table 6.
Summary of Replacement Needs, Tables 1-5

Rank	Replacements Required to bring faculties to 1940 level	Number expected to retire in next ten years	No. above 1940 level expected to be added at end of war	Total
Deans and Professors	3*	18		21
Professors	20	50†	26	96
Associate Professors	5	7	8	20
Assistant Professors	11	5	27	43
Instructors	45	9	35	89
Assistants	47		51	98
Teaching Fellows	29		10	39
Research Fellows	3		17	20
				426

*Includes 1 dean for a new college of pharmacy in process of organization.
†Exclusive of 18 deans who also have the title of professor.

Assuming that the needs for replacements in the five accredited colleges which did not respond to the questionnaire to be of the same magnitude as those of the colleges which did respond, the total for column 4 should be increased by approximately 8 per cent, which makes a grand total of 460.

The foregoing data show that a large number of replacements will be needed as soon as the war has ended to bring our pharmaceutical faculties up to their pre-war levels; that many members of these faculties, particularly in the higher ranks, have reached the age where they will have to be replaced within the next ten years and that a considerable number of additions to the faculties are contemplated. Taken all together these needs add up to 460 in round numbers.

All replacements and additions above the rank of assistant should have had one or more years of graduate study in their respective fields to meet the requirements of the American Council on Pharmaceutical Education for educational qualifications. With only 85 graduate students enrolled in our colleges of pharmacy at the present time, less than twenty-five percent of whom will take up teaching, it will be impossible to meet these demands unless pharmacy students can be induced to take up graduate work in much larger numbers than they have in the past. The situation is serious and will become more serious as the war continues, unless some provision is made by Selective Service System for the deferment of pharmacy students. Every possible effort must be made to meet it if impairment of our standards for pharmaceutical education is to be avoided.

A Plan of Instruction in Biologic Products

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It has become common practice in the teaching profession to formulate aims and objectives of any given course before preparing an outline or undertaking instruction. That is what we have done in the case of biologics, and we have set up the following as our objectives:

1. It is clearly obvious that the pharmacist's knowledge of these drugs should be as comprehensive as his knowledge of other drugs if he is to render full, competent and efficient service as a dispenser of biologic products. This is also especially true if his profession is to be recognized as a public health profession.
2. The pharmacist should have a clear conception of the fundamental principles and facts of immunity. This will enable him to comprehend the mode of action of biologics. This is quite comparable to the fact that a student should understand the physiology of the parasympathetic nervous system before undertaking the study of the pharmacodynamics of drugs affecting the parasympathetics.
3. The pharmacist should have sufficient knowledge of the infectious and contagious diseases, and the use of biologics in the control or prevention of them, to engage in public health education.

   Of all the public health professions pharmacy is in the most strategic position to engage in public health education. It is most regretable when the individual pharmacist is not trained to do so.

Having established our aims and objectives, we turn now to the content of the course.

In order to attain our objectives the subject material consists of an elementary course in immunology, a fairly detailed study of the biologics and the essentials of preventive medicine and biotherapy. It should, of course, be as non-technical as possible. If the teacher limits his discussion, especially of immunology, to the essentials it need not become too technical. Only those essentials of immunology which will provide the student with sufficient background to comprehend the mode of action of biologics, need be presented.

Our plan of instruction is about as follows:

1. Immunology—definition and scope
   - Immunity—definition—kinds or types
   - Means by which the body resists invasion
   - First line of defense—
     - skin and mucous membranes
   - Second line of defense—
     - phagocytosis
   - Third line of defense—
     - antibodies—types and functions—
       - antitoxins, lysins, opsonin, etc.

2. Biologic Products—general considerations
   - I. Biologic products composed of antigens
     - A. Vaccines—definition and types
       1. Bacterial vaccines
          - preparation
          - standardization
          - typical examples
          - use and mode of action
       2. Oral vaccines
       3. Virus vaccines
       4. U. B. A.
       5. Toxins
       6. Tannic acid precipitated toxin
       7. Toxoids and alum precipitated toxoids
       8. Combined antigens, all discussed in similar manner as bacterial vaccines.
   - II. Biologic products composed of antibodies
     - Antitoxins—definition and general consideration
       - Preparation
       - Standardization—units etc.
       - Typical examples
       - Uses
     - Antivenins
     - Antibacterial sera
     - Convalescent sera
     - Immune globulin
       - All discussed in similar fashion
   - III. Antibiotic products
     - Penicillin and related substances
   - IV. Bacteriophage preparations
   - V. Pollen extracts and related products
     - their uses and limitations in hay fever, asthma and eczema
3. Infectious and contagious diseases

Definitions and general considerations

- Brief review of the pathogens
- The means by which pathogens produce disease
  - By production of toxins, hemolysins, leucocidins, etc.
- Sources of these diseases
  - man—typical cases, atypical cases—carriers—lower animals as source of disease
- The means by which diseases are transmitted
  1. Air borne diseases—diphtheria, scarlet fever, whooping cough, small pox, meningitis, colds, poliomyelitis, measles, etc.
  2. Filth borne diseases—typhoid, dysentery, cholera, undulant fever, etc.
  3. Insect borne diseases—typhus, plague, malaria, yellow fever, rocky mountain spotted fever, tularemia, etc.

4. Direct contact diseases—syphilis, gonorrhea, tetanus, anthrax, rabies, gas gangrene

Using the above classification, we then begin the study of each disease and the following information concerning each is presented:

For example—Diphtheria

1. Brief description
2. Causative organism
3. Mode of transmission
4. Means of control—"We have the means to wipe diphtheria from the face of the earth. All we need do is make use of them." Quotation from "The Conquest of Disease" by Thurman B. Rice, M. D.
    a. The Schick test—its applications—uses of toxin
    b. Active immunization—its indications and applications—use of toxoids and T. A. mixture
    c. Passive immunization, biotherapy and the uses of antitoxin—doses
    d. Other means of prevention
        1. Isolation and treatment of carriers
        2. Isolation of actual cases
        3. Importance of pure milk supplies

Literature and Text books:

There is a wealth of material, but most of it is quite technical. Unless the student has had technical courses in medical bacteriology, immunology and serology he is unable to obtain much benefit from most of them. Such books as "Immunology and Biotherapy" by Kolmer and Tuft, "Preventive Medicine" by Boyd, "Bacteriology" by Rice and "Microbiology and Man" by Birkeland provide excellent sources of material for the teacher. Text books are soon outdated and the teacher will need such references as: The Journal of A. M. A., Journal of Public Health, Journal of Bacteriology, Journal of Immunology, etc. Some of the students can be induced to consult these references also.

The teacher of a course covering biologics and their applications is therefore compelled, most of the time, to present it as a lecture course. Since it is such a rapidly changing field, perhaps that is the best plan of instruction.

From Farm to Pharmacy

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He was a farmer for a quarter of a century. In 1942 he decided to give up farming, follow in the footsteps of his daughters, and enroll as a freshman at the University of Kansas. A career as a pharmacist was his goal. Carl Robson, age 47, received his diploma, Bachelor of Science in Pharmacy, amid plaudits of his classmates at the Commencement Exercises in Memorial Stadium on the University of Kansas campus June 24. He was the honor man of the School of Pharmacy, and, in fact, had the highest scholastic record of any graduate in the history of that school.

His daughter, Mrs. Charlotte Brock, a Pharmacy graduate of K. U. in 1944, had come back from Sterling, Kansas, where she is a pharmacist in her naval officer husband's father's store, to congratulate him. Mrs. Brock's husband is also a K. U. Pharmacy graduate of 1944. Another daughter, Margaret Robson, who was graduated from the University in 1943, is a bacteriologist in a large hospital in Chicago. A son, Harry, who is a sophomore at K. U. in chemical engineering, and a daughter, Frances, who is a junior in the Lawrence high school, were there. His wife, Nellie, was beside him, as she has been from the time that they decided to leave the farm.

"If I had it to do over again, I would do it," the graduate said. "I was miscast as a farmer, even though I stuck it out for 22 years. But it took the war, and the farm manpower shortage to convince me that it was time for a change."

When he made the break he made it a clean one. He left his farm in Burlington, Kansas, and he and his wife took an apartment over a grocery store on the main street of Lawrence. They have been there ever since. She took a job as secretary in a Lawrence manufacturing firm which helped support them.

"There is no reason why a person who feels he has been

*Here is a human interest story that should be an inspiration to many a student who is beyond the average college age level. It reminds one of that famous Lascoffism—"It can be done."—Editor.

miscast can not come up and make the adjustment and start over," he declared.

At first it was not easy, he admitted. "In fact there was one time when I was about ready to quit. It is a little difficult to get into the study habits necessary to successful scholarship. But I was cured one day when I tried to help a younger student make the same adjustment. When I had finished talking to him I discovered I was all right, too. I've been all right ever since."

And that story is indicative of the place Pharmacist Robson has had among his classmates. He is the "Dad" of the School of Pharmacy, according to Dean J. Allen Reese.

"There are some advantages to enrolling as a freshman when you are older," Robson maintains. "There is, or was for me, a disadvantage: memorizing—so necessary a part of a pharmacy course—was difficult for me, although not as difficult as psychologists have indicated. But when it comes to weighing facts and making decisions—the power of analysis—I think an older person has the advantage over the other students."

"I suppose the most difficult adjustment was between the professors and myself. Sometimes, at first, I kind of cramped their style, but not so much in the straight scientific courses as in the others. They're used to talking to younger students and they use illustrations which appeal to that group. Sometimes I could tell they had to scratch a bit to make it sound appropriate for a more mature person. But I think it was good for them."

As for extracurricular activities, he says he could take them or leave them alone. "You have just as much school spirit as anybody else—not the old 'Rah! Rah! stuff' you don't take that up, but you are just as loyal and want your team to win just as much as the eighteen-year-old sitting next to you at the game." He was active in the professional fraternity, serving as Vice-Regent and finally Regent of Kappa Psi, international professional pharmaceutical fraternity.

Even today, after three years away from the farm, Robson gets up at 6 a. m. every day. "I found that was as good a time to study as it used to be for doing chores.

"I guess some of my friends around Burlington thought it was just a stunt, and I would not last when I started," he recalls. "But they know I meant business, and now we are just as good friends as we ever were."

He is a combat infantry veteran of World War I, and a former Commander of the American Legion in Burlington, Kansas.

While a student he has been an assistant instructor in the chemistry and pharmacy laboratories at the University of Kansas, and did some "unofficial coaching" on the side. He was also an unofficial assistant in the state drug laboratory operated in connection with the University. He represents the first of the graduates of the war-time accelerated curriculum at the University, finishing the four-year rigorous training in three years. He has been in school without a recess since he started. His grade-point average is 2.75; an average of 3 is perfect. This represents all "A's" except for an occasional "B". He is the winner of the Lehn and Fink Gold Medal and the Kappa Psi Scholarship Key for excellence in school work.

Summing it all up in reply to the question as to whether or not the whole thing was profitable, Robson said, "Culturally, no! I had kept up my reading. I did not want that kind of course. Had I looked for culture I could have received it. But I wanted professional training with a scientific background and I got it in the School of Pharmacy. And from the standpoint of interest in life, well, I do not know what I could have done to make life more interesting."

He has already begun work in the drug store. Mr. H. W. Stowits, pharmacist-owner of the Rexall store in Lawrence, Kansas, has accepted his preceptorship for licensure. "Mr. Robson will make an excellent contribution to the pharmaceutical services of my store," Mr. Stowits says. The quarter of a century of farming has left its imprint on Mr. Robson's interests. He loves veterinary medicine and knows animals and, no doubt, he will gravitate to the sale and manufacture of veterinary pharmaceutical products.

A Critical Evaluation of the Accelerated Program*

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The title which has been assigned to me is a very formidable one and deserving of much more study than I have been able to give it. The subject, however, is a timely one and as teachers we must of necessity give thought to it.

Dean P. H. Dirstine(1) sent a questionnaire to the deans of the colleges of pharmacy last spring inviting them to express their views upon the problems of acceleration. It is not in order for me to give more than a brief summary of the results of this survey. Of the 53 schools which replied, 49 of them had accelerated their programs. The majority of them began their programs of acceleration in June 1942. This made it possible to complete the work for the baccalaureate degree within three years. In some instances the time was 2 years and 8 months and in pharmacy a few schools had planned to complete the curriculum within 24 months, although this plan was never carried out.

The 16 weeks term seems to have been the most popular one. The terms began at various times of the year although some were adjusted to conform to the Navy V-12 program which meant that they began in July, November, and March. Freshmen were entered and seniors graduated at least three times a year. In some cases interim registration was made available and even graduation exercises were held in September, January, and April, and perhaps at other times.

All but a few schools, 44 out of 50, indicated that they did not like the speedup program and would not continue it long after the war ends. Only one school out of 48 expressed itself as favoring a speedup program during normal times. Seven schools seemed to feel that the accelerated program should be retained for the returning soldiers who wished to enter or continue in college after the war. Thirty favored the normal program for soldiers and others had no definite opinion in the matter.

*Read before the Conference of Teachers of Pharmacy at the 1944 meeting at Cleveland.

From a summary of the replies to this questionnaire only four schools expressed the belief that our standards of scholarship had been raised by the accelerated program. Twenty-seven schools said that their standards had been lowered. Forty-six schools expressed the view that it was not good educational philosophy to argue that students could accomplish in 30 to 32 months what they had formerly taken 36 months to do.

No school felt that either the students or faculty would follow an accelerated program under normal conditions. While 40 schools were now completely accelerated, it was the view of 39 of them that acceleration would be discontinued at the end of the war.

It is clear that a number of our schools never accelerated their programs. While the majority of them accepted acceleration, many are now discontinuing it and returning to the normal school calendar.

Students are, it would seem, a little less severe in their criticism of the accelerated program than are the members of the faculties. The students, especially the capable ones, are the persons who benefit mostly from an accelerated program. Such a program is hard on both the faculty and the administration. It is hard, too, on the slow or below average student, especially if the program is made compulsory. Purdue University has had an accelerated program since December 1941, but it has not been compulsory for civilian students. These students are privileged to remain out of school for a term and return at the beginning of the following term with no disadvantage as to schedules.

What Did Acceleration Do to You?

Your chairman proposed eight pertinent questions for me to discuss. The first of these is, "How good do you believe your teaching has been under the accelerated program?" Since I have had to do very little changing in the matter of courses or subject matter, I have no reason to believe that it has been any better or any worse than usual so far as presenting it is concerned. The young men who were about to become of service age were often unsettled and unconcerned about their courses. This was always reflected in the quality

of work they did. Women students were not affected in any way so far as I could discern.

The second question, "Do you think the student has benefited as much as under the former program?" is a very hard one to answer. If by the speeded up program the student was permitted to graduate several months ahead of the normal time of graduation or before he had to report for service in the armed forces, he should have been benefited. In cases when the matter of a degree meant a commission in the armed services this would be considered beneficial. Civilian students who graduated ahead of schedule were permitted to serve their profession which, in the case of pharmacy, was a distinct advantage to all concerned.

The third question, "Have library assignments and readings been as frequent? Have they been well covered by the student?" To both parts of this question I should answer in the negative. The conditions which brought about acceleration were not and are not, even yet, conducive to studiousness, although I feel that they are improving. While the staff and students alike have been admonished to maintain high standards of teaching and scholarship, the general feeling seems to be that we should not and could not expect quite as much of the student as we had been used to doing. In some courses I have shortened my library assignments; in others I have not. This happens, however, in peace times as well as in war.

The fourth question is, "Have you presented in your allotted time all of the subject matter you formerly did? Or, as provided in the Syllabus?" I can say that we have been able to do this at Purdue but as the term was cut from 18 to 16 weeks the semester final examinations were abolished. As one who believes that final examinations properly managed, have considerable merit, there has been some loss at this point. The matter of final examinations is a subject of much debate and differences of opinion and cannot be settled here.

"Have you found time to keep abreast of changes and carry on experimental work?" is the fifth question. The accelerated program has kept some of us in the classroom for 48 weeks in the year with a full teaching schedule most of the time. Experimental work for most of us has to be crowded into our teaching program even in normal times. In case of

heavy teaching schedules we should all admit, I am sure, that experimental work and keeping abreast of the times are matters that become neglected in peace as well as in war.

These conditions apply very well to question 6, "Have you found time to revamp your lectures and experiments?" It may not be a matter of time but our curriculum has undergone changes, somewhat less than usual, perhaps. More radical changes are to come when conditions become normal again. No doubt many schools had to make numerous changes in courses and schedules in order to fit into an accelerated program. Such changes may carry over into the post war program.

Regardless of the opinions of the teachers, the students will settle question number seven, which is, "Can the students in peace time be regimented and controlled as they are under military training?" My feeling is that they cannot. American youth, as I see them, dislike military regimentation. They accept it in the case of a national or an international emergency such as the present. When the armistice is signed they will all want to come home, and right now. They prefer the so-called normal life whatever that may be. On the other hand, students regiment themselves rather easily to the routines of a college life, imitating each other or the student leaders in college goosestep fashion.

The eighth and last question asks, "How long can we, as teachers, continue with the accelerated program and do efficient teaching unless adequate breaks are found between years or courses?" We have all accepted the accelerated program as an emergency. It is a part of the task of winning the war and we propose to accept it as a temporary necessity. When the war is over about 99 per cent of us will want to do away with acceleration. Not because we cannot take it, but because we need not take it. W like breaks in the form of vacations and leaves of absence and if we are good teachers we will make use of such for physical and educational improvement.

How Have We Reacted to Acceleration?

Acceleration is not at all new in American colleges. It has been defined by Eckelberry as, "Any change in educational practice which enables or encourages a student to complete one

or more stages of his formal education or to prepare himself for entrance upon a position for which it prepares him, at an earlier date than he would normally have done under traditional practice."(2) Summer sessions offered by many colleges are a means whereby the undergraduate may speed up his collegiate program and graduate short of the usual four years, say within three to three and a half years. It is not uncommon for students to do this.

Wooster College sent out a questionnaire in 1942 to which 187 colleges replied.(3) Of these, 148 stated they would hold summer sessions eight to fifteen weeks in length, and others would hold shorter sessions. 102 had moved up commencement one to five weeks and degrees could be earned in three years or less.

A questionnaire sent to the engineering colleges brought responses from 126 of them. Of these, 103 planned to accelerate their programs and graduate students in less than the usual periods.(4) The engineers had expected to make use of the summer session to speed up graduation of the 1943 class. However, only about one-half of the number of students expected were attracted by the summer programs. Students took advantage of the high wages available and worked during the usual vacation period.(5)

Perhaps the best information concerning the acceleration of the colleges is to be found in the replies to a questionnaire sent out by the Statistical Division of the U. S. Office of Education. The 1756 colleges and universities in the educational directory were asked to report the changes which they had made in an effort to facilitate acceleration between June or July 1939 and 1942. Of the 1,756 institutions addressed, 947 made reply. Of this number, 174 had adopted an all the year around program in 1939 and 1940. One-third of them, or 313 schools, had made no adjustment while 489 schools had gone on a yearly basis for 1942-43. This report would indicate that the colleges and universities of the country responded to the idea of making it possible for their students to graduate within a shorter period of time than usual.

The three following types of organization were used to accelerate the school programs, to an all year around basis: (1) Two semesters and a 12 weeks' summer session; (2) Three

terms; and (3) Four quarters. Either of these add up to about the same number of weeks and eliminates the usual long summer vacation, the Christmas and spring holidays, and other such vacation periods, for students, faculty, and administrators.

There is no gainsaying that the colleges and universities accepted the program of acceleration in good faith. If they felt that a hurried academic experience might be inferior to a more leisurely one they forgot about it in face of the emergency. They knew as Withington said that " . . . the academic mills must grind constantly, even hurriedly, noisily, unceasingly—or the mill will be shut down, and the raw material taken to another factory. So completely has the academic world taken on the aspect of the industrial that administrators think of themselves as managers, of the faculty as hired laborers (in no ideal vineyard) and of the students as raw material to be turned into a finished product in record time."(6) He goes on to say, "that the war effort needs technics and skills is obvious: they are the only things that can gain by acceleration—but they are only half the story. Education must not maintain acceleration unless it means to cripple itself."

We need to be aware of the fact that it will require more than technics and skills to live together in peace after the war. Acceleration may help us to meet the immediate needs of an emergency but it does not give us the thing we live by. It may be tolerated as a necessary evil in times of stress but should not be more than temporary if we hope to develop and maintain a cultured, sympathetic, philosophic, democratic way of life with a proper sense of proportion and an abiding sense of humor. Our program of education, to be worthy of the name, must include the humanities, languages, literature, history, the arts, philosophy, ethics, morals, and religion. It is not possible to think of wisdom, intelligence, judgment, maturity, and understanding in terms of acceleration.

There are those who believe that the war has hastened the modernization of our higher educational system exemplified by acceleration. From the A. and M. College of Texas comes the statement that "higher educational institutions, in the peace to come, must prove their value or perish."(7) Over against this view Black and Murphy(8) discuss the dangers threaten-

ing liberal education because of acceleration. They say that "the training proposed will simply leave vacant that whole area of mental life which lies between indoctrination—the inculcation of an attitude of unconditional acceptance of unexamined ends—and technical skill for the attainment of ends set by authority." They point out that liberal arts and science use ideas freely and wonder what the generation now being trained will have to think with. We must not lose sight of the fact that men who are being trained to fight now are to be American citizens after the war.

In discussing education in America, Dorothy Thompson (9) points out that the war "has brought into focus the faults of our education and, at the same time, started new procedures which raise grave questions." She indicates that the colleges are under fire because of the fact that thousands of men in the armed forces had no knowledge of mathematics and thousands of others were totally unable to formulate orders or reports in respectable English. This is a severe but true indictment not only of college graduates but of the freshmen entering college. Freshmen who have been well trained in English and mathematics are usually able to carry on in college without much trouble. To those in our high schools who contemplate going to college I should like to urge thorough training in these two subjects. Good training in these subjects might even be of greater value to those whose educational career ends with high school graduation.

It has been reported that students have been known to graduate with the Bachelor of Science degree without having had any courses in science. The elective system too has been so manipulated that students have been graduated with credits in a heterogenous lot of widely unrelated subjects. This does not make for education suitable for an enduring democracy. Something should be done to improve a system of education which permits thousands of young men to have a college experience and to graduate without being educated in any sense of the word. Miss Thompson portrays a situation that we as educators are able to understand and appreciate. She says that, "our education, therefore, must be reunified and reintegrated, or we shall cease to be a society of free men and women and become a conglomeration of robots held together by imposed military and industrial disciplines. We cannot return to the mediæval curriculum and the theological disciplines of

early New England but we must re-establish integrated education and create the moral education fitting to the age."

For the post war world it is not so much a matter of an accelerated school program as it is an improved one. The Society for the Promotion of Engineering Education at its annual meeting in June this year gave thought to this problem. Walters(10) has summarized the heart of the discussion as follows:

"Two problems stand out as of great importance: (1) devising more valid means than have been employed in the past for selecting and admitting students and insuring better preparation in secondary schools, and (2) building up faculties not only to the prewar level of effectiveness but well above that level. Engineering education can never advance beyond the qualifications of its students and teachers. Hence, the engineering profession, industry, and the public who have a vital interest in its welfare should vigorously support every possible means of improving the quality of its personnel." The problems raised by the engineering educators are quite applicable to the field of pharmacy.

We in pharmacy have gone a long way in the matter of improving our teaching personnel by demanding men of better educational qualifications. With this have come improvements in the curriculums, laboratory and library facilities, and the four year course as the minimum for graduation from our schools of pharmacy. The students who come to us from our high schools are not as well prepared as we should like for them to be. Many of them, it seems to me, are not capable of doing even moderately good work in college and never should have been allowed to enter. The mortality of those entering college is high and perhaps always will be but one sure way of lessening it would be to admit only those students who have demonstrated their ability to do college work successfully.

Has the present emergency taught us anything? Yes, it has and that is that we should be careful and thorough in our teaching and more exacting in our responses from students. I do not mean this so much as a matter of discipline as of thoroughness of training. We modified our college programs in the present emergency in the interest of national welfare. This is a worthy cause in peace as well as in war.

In the present emergency acceleration has meant a mass educational movement designed not so much to help the stu-

dent as to give aid to the armed services. When peace comes acceleration as we understand it now will be dropped. Any peace time acceleration should be purely voluntary on the part of those participating. The colleges and universities should, more than ever before, improve their facilities and encourage capable young men and women to speedup their time in college. If such persons can meet the requirements for the Bachelor's degree by the end of the sophomore year, grant it to them. Our system of courses, credits, and semesters is a very effective device for holding back the good students and pushing up the slow ones in an effort to keep them together.

I have come recently to describe the professor as the man who asks the questions and then answers them. In reality this is ridiculous but what do you do when students refuse to study and come to class unprepared to answer your questions over the subject matter? Of course, you answer your own questions not just to show the students that you know the answers but to keep the atmosphere of the classroom enlivened. We then resort to lecturing instead of serving as quiz masters. It is a distinction to be a good lecturer but quiz masters are deserving only of epitaphs. Chen(11) has told my story better than I can say it. He states that "colleges are led more and more to realize that true education must be an individual affair, and teaching methods are being modified to promote individual study and to promote individual guidance."

I often tell my students that the equipment in the laboratory such as balances, weights, graduates, pippettes, and chemicals are relatively accurate tools and that most errors are those introduced by the operator. In other words, the student is the uncertain factor and it is our job to train him to be just as reliable in his performance as are the tools he uses.

The most desirable change that we can make in our educational program in the post war world will be the change we make for better teaching on the part of those who teach and for better and more thorough training on the part of the student. The factor most at fault in our educational program is the human factor. Whatever needs to be done to bring youth up to become better trained men and women let us set our task to that job.

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A Comparison of Pharmacy Curriculums Over a Twenty-five Year Period

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The refusal of the War Man Power Commission to grant more than twenty-four months deferment for students in pharmacy caused many educators to look critically at their so-called four year course in pharmacy and determine its content. This refusal for deferment together with the constant reminder from various local university groups, that pharmacy is not a four year school, inspired the writer to analyze the pharmacy curriculum of the University of Idaho College of Pharmacy and study the evolution that has taken place in its curriculum since its organization in 1920.

This school was organized in September of 1920 offering a two-year course in Pharmacy, to which was added a third year in 1921, and in 1930 the minimum four year course leading to the degree of Bachelor of Science in Pharmacy was instituted. Inasmuch as the College of Pharmacy has been a member of the American Association of Colleges of Pharmacy

since 1927 and the curriculum at that time was essentially the same as that in 1921, it is fair to assume that the earlier curriculum would have met with the approval of the association. An analysis of the curriculum during the intervening years of 1920 to 1945 would then represent a curriculum acceptable to science groups which most universities require completed beeducation.

In order to study the curriculum offered during this twenty-five year period it was broken down into the basic arts and science groups which most universities require completed before a candidate is eligible for a bachelor of science degree. Table 1, shows the distribution in semester hours at five year intervals of the pharmacy curriculum offered during this twenty-five year period. In addition the last column show the total number of semester hours required for graduation.

Table 1.

Semester Hours Required in Five Basics Groups for Graduation in Practical Pharmacy

Year	Pharmacy	Natural Science	Social Science	English	Electives	Total Sem. Hrs. Required
1920	44	24	0	0	0	70
1925	53	45	0	6	2	104
1930	69	34	6	6	14	124
1935	71	39	6	6	22	138
1940	76	25	6	6	21	138
1945	69	29	6	6	31	138

An examination of the above table will show that the school of pharmacy at the present time is offering only one-half of the work required for graduation in pharmacy. To put it another way we are merely offering an arts and science degree with a major in pharmacy. It is also apparent that the pharmacy required in 1920 when only two years was required represents 64 per cent of the pharmacy work now required for the four year degree. We have achieved our four year course by adding the so-called cultural subjects and requiring more electives. The electives have increased from 0 in 1920 to 31 semester hours in 1945.

Following in the paths of other schools, the University of Idaho College of Pharmacy in recent years introduced the so-called Scientific Pharmacy curriculum. A survey of this type course shows that while it may be a strong science course, it is extremely weak as far as required pharmacy is concerned.

Table 2.

Semester Hours Required in Five Basics Groups for Graduation in Scientific Pharmacy

Year	Pharmacy	Natural Science	Social Science	English	Electives	Total Sem. Hrs. Required
1940	42	65	6	6	17	138
1945	40	60	6	6	25	138

As noted in Table 2, there are 60 semester hours of natural science required as compared with 40 semester hours of pharmacy. Comparing this course with the two year course offered in 1920 it can be seen that there is actually two semester hours less pharmacy required in this a four year curriculum than under the old two year course. Nevertheless we allow graduates under this curriculum to go into retail pharmacy and practice with the same privileges of those men who have graduated under the practical curriculum and have been required to take almost double the amount of actual pharmacy work. The Executive Committee of the American Association of Colleges of Pharmacy (1937) report that 79.5 per cent of all pharmacy graduates go into retail pharmacy, 7.8 per cent go into other pharmaceutical fields, and the remainder do not stay with the profession, but go into medicine, dentistry and related fields. From this report it would seem that this scientific curriculum is merely an attempt by pharmaceutical educators to bolster enrollments with students whose ultimate plans are medicine, or dentistry.

From Table 1 it can be clearly seen that we actually require only two years of pharmacy and two years of arts and science. While in the scientific curriculum indicated by Table 2 we require only 40 semester hours or about one and one-quarter years of pharmacy and two and three-quarters years of arts and science. It should be emphasized that this is not just an isolated case. A study of the curriculums of other schools, re-

veals the amount of actual pharmacy required, varies from 40 to 70 semester hours. Yet in view of this fact the American Association of Colleges of Pharmacy require that a person spend three years in a college of pharmacy, regardless of his previous science training. If we consider 105 semester hours as three years of work, it is apparent there is not enough required pharmacy in our curriculum to fulfill this requirement. As a result the transfer student must take numerous electives in pharmacy which are not required of the regular students.

The point I wish to make is this. Why do we allow a person to graduate after four years with 69 semester hours (Table 1), or two years of pharmacy if he spends all this time in a pharmacy school, and then require a transfer student with two years of required arts and science work to take three years of pharmacy or a total of five years? The answer to this problem is that we are trying to put five years' work into four and as a result we must either leave out some pharmacy as Table 1 indicates, or put the pharmacy in and leave out some of the arts and science courses. The result is usually a compromise between the college of arts and science and the college of pharmacy.

This problem should be solved in a manner similar to the method used by our schools of medicine, dentistry and veterinary science. Namely to require pre-pharmacy. This would require that some courses now offered be placed in the pre-pharmacy curriculum. The point of cleavage is natural. The basic subjects such as English, social science, general chemistry, general biology and mathematics, should be in the pre-pharmacy work. Other courses which have pharmaceutical implications such as organic chemistry, botany, physiology and physiological chemistry should be given in and by the professional school. To emphasize this point still further anyone who has taught pharmacology will agree that a fundamental course in physiology is basic in developing the pharmacodynamics of drugs. In a like manner, one familiar with the course work in anatomy and physiology as it is given in the college of arts and science will agree that there is too little actual physiology to be of much value as a foundation for pharmacology. In a similar manner the organic chemistry that is offered in most arts and science schools has very little appli-

cation to the organic chemistry of modern medicinals. Other suggested courses which should be required in addition to those now offered are, biological assay, laboratory work in pharmacology, hospital pharmacy, pharmaceutical economics, manufacturing pharmacy, clinical pharmacy, immunology, serology and biotherapy.

Opposition to the above suggestions will come from those educators who measure the success or failure of their school in terms of the number of students enrolled. As long as pharmacy continues to offer only an arts and science degree with a major in pharmacy we cannot expect any more professional recognition than any other college graduate with a major in one of the numerous fields.

It will be a serious mistake if we do not in the future see to it that the quality and quantity of graduates are in keeping with the demands for their professional services. A long step in this direction would be to require one year of pre-pharmacy training. This would not only tend to control the number of graduates, but would improve the quality and standing of those entering the profession. When this is done pharmacy can be practiced with the dignity of its calling and can rightfully claim its place with the other health professions.

An Active Prescription File as a Teaching Aid

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University of Washington, College of Pharmacy

It is sometimes difficult to adequately impress students in dispensing pharmacy with the seriousness of their compounding when their prescriptions come from a laboratory manual or are dictated by the instructor. The value of the training is not as apparent to the student as it would be if he was directed to an active prescription file and told to refill therefrom certain of the orders.

This procedure has more force despite the fact that in the majority of colleges the instructors see to it that their students have plenty of practice on current prescriptions that they have collected in their visits to drugstores. The presence of the prescriptions in a file that is in actual use means, in the minds of the students, that they are the real thing and merit commensurate treatment or consideration. On the other hand selected prescriptions dictated or printed on sheets of laboratory instructions are considered theoretical, and therefore, not too practical.

Colleges cannot easily find active files which can be kept in or near the prescription laboratory for student use. The University of Washington, College of Pharmacy, has been fortunate in being able to partially solve the problem. Mr. L. D. Bracken, one of the nation's outstanding professional pharmacists and the owner of three prescription stores in Seattle, recently loaned the college a file of more than 500,000 prescriptions that has become only moderately active due to age. It was begun in 1897 and terminated in 1934. As requests are presented for refills the college is called for copies which are then incorporated into the store's newer files. In this way the value of the file to the store decreases each year, but its activity is still sufficiently great to make the student feel he is working with something that reaches directly into the practical operation of a pharmacy. One might question the frequency of use for a file going back to 1897. We have had refills requested as old as 1902. It contains the standard formulas good for illustration and teaching of routine compounding procedures, and is the property of one of the nation's best pharmacies. Students cannot help but see that prescriptions they select from it for laboratory study represent the practical daily problems of the profession.

The college is experimenting with the file to find out the most practical way it can be used to further the teaching of dispensing.

We recommend that other colleges make an effort to secure such a file, and we urge practicing pharmacists located in cities where there is a college, to loan little used but still active files to the institution.

Desirability and Feasability of Limiting Post-War Enrollment in Colleges of Pharmacy*

DAN HALL

Bismark, North Dakota

Assuming that, following the war, colleges of pharmacy will be flooded with students desiring to enroll then there can be no question in the writer's opinion, the colleges will be faced with the problem of desirability as well as feasability of making selections. These problems ought not to be too difficult to solve and administer. In dealing with the desirability, schools will have no alternative but to endeavor to select the better minds and the better qualified applicants. This question compares favorably to a fishing trip. Upon arriving at the lake the anglers are aware that the fish are really striking. Colleges of pharmacy are limited as to the number of students they can enroll and educate—just as the angler is governed by restrictions, as to the number of fish he is permitted to catch. Let us assume that we are fishing in any one of the many beautiful Minnesota lakes for pike. The limit for each individual to catch is eight. Consequently the far-sighted fisherman is going to select only the finer fish and eliminate the less desirable ones. Likewise the schools of pharmacy, bearing constantly in mind that they wish to educate and contribute to the profession the better educated and qualified individuals, should select the better applicants and limit the number of selectees to a figure in keeping with their equipment and teaching personnel of the school.

The following suggestions are made thinking they may be of some value in solving the enrollment problem in the post-war era.

Colleges of pharmacy should be required to submit candidates to a screening test, the severity of this test should be determined by the number of applicants. It appears to the writer that the following suggested appraisals should be considered to some degree in registering a student in pharmacy:

(1) The previous education of the applicant.

*Read before the Minneapolis 1945 meeting of District No. 5, Boards and Colleges.

(2) What was the environment of the applicant during his preliminary education which persuaded him to elect pharmacy as his vocation.

(3) Was his father or some member of his family engaged in pharmacy which helped him make his choice.

(4) Was he in any manner associated with the drug industry during his previous life which influenced his selection.

(5) Was the applicant a member of the armed services and if so was he attached to some division of a medical department which created the desire.

This is a partial list of factors which should be considered when endeavoring to determine whether the candidate possesses the desire, and is conscientious in the selection of pharmacy as his vocation.

Do you not agree that it would be quite easy to discourage a candidate in selecting pharmacy who had not been influenced in his selection by some of the factors named? It is an indisputable statement that the majority of parents, when enrolling the child in a school of higher education, even though he may have selected his choice of study, they solicit with appreciation, the analysis and suggestions from the faculty concerning the course of study their child is best fitted for. If the child has arrived at a decision, suggestions and criticisms as to whether or not he has made a wise selection are also appreciated. I firmly believe that the greatest responsibility confronting our educators is to assist the confused student in establishing himself in a course of study best suited for him and one in which he is the most likely to be contented and successful.

The most important factor in the enrolment in a course of pharmacy is the possession of a desire on the part of the student to pattern his future life. What knowledge he may possess of the tasks outlined in the selection of pharmacy is a major factor in determining the creation of a happy citizen in and an asset to his chosen profession.

In conclusion, I will submit briefly, for your consideration, the following suggestions:

(1) That admission to colleges of pharmacy be limited to high school graduates who were in the upper two-thirds of their respective classes.

(2) The colleges of pharmacy should assume the responsibility of screening in accepting students for enrollment.

(3) One year of pre-pharmacy—similar to that practiced by the medical schools.

(4) Assuming there will be a normal enrollment from high schools plus a number of veterans it might now be the time to begin the selecting process.

(5) The colleges must be expected to enroll in addition to material for retail practice, a number who will continue graduate work with the idea of becoming teachers, research workers and manufacturers' representatives.

Report of the Committee on Libraries---Concluded*

TEXT AND REFERENCE BOOKS IN CHEMISTRY

ELDIN V. LYNN

General

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*Dr. C. O. Lee, chairman of the Committee, calls attention to the fact that the 1944 report of this committee (see American Journal of Pharmaceutical Education, Vol. VIII, No. 4, pp. 485-507) was not complete. Two assignments, lists of texts and reference books on chemistry by Dr. E.V. Lynn and on pharmacy by Dr. Edward J. Ireland had not at that time been completed. The completed lists are presented in the following pages.—Editor.

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EDWARD J. IRELAND

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*The author aimed primarily at compiling a list of books used specifically in the field of pharmacy. Some of those selected will help to point out the epochs of advancement as well as to illustrate the conditions and the spirit under which revisions of our professional literature were made. The reader will also find by browsing through any of these books that the subject matter does not quickly become obsolete. Even a book like Jacobi Le Mort's Pharmacia, one of the first pharmacy texts, written in 1688, illustrating pharmaceutical apparatus, when used with proper presentation has definite teaching value.

In the preparation of this list I have naturally striven for a classification. I purposely refrained from listing pharmacology texts although in some instances these texts might be considered pharmaceutical in their subject matter.

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Dr. Robert P. Fischelis voiced what we believe to be the opinion of all thoughtful pharmacists, educators and veterans themselves, when he spoke recently before the Western New York Branch and the University of Buffalo to student branches of the American Pharmaceutical Association and said as reported by the Buffalo Courier Express:

"We favor granting equitable credit for training and experience gained with the armed forces, but are opposed to elimination of any substantial requirements under the guise of doing something in favor of returning soldiers and sailors.

"The war veteran who was compelled to interrupt his college training or his internship to serve his country should receive all possible consideration in his effort to complete that training and in qualifying as a licensed pharmacist.

"However, it is doing neither the war veteran nor the people he is going to serve one bit of good to eliminate in whole or in part the minimum standard of training required.

"We doubt very much whether the young veterans of this war want to see their profession cheapened by lowering standards of licensure.

"It should be remembered that our ultimate responsibility is to the public. When we allow only partly trained and partly competent persons to assume the duties of licensed pharmacists, we expose the public to the dangers of incompetent service."

Mr. Wilbur E. Powers of Trenton has been elected secretary of the New Jersey Board of Pharmacy to succeed Dr. Robert P. Fischelis.

Editorials

Is the Pharmaceutical Press a Free Press?

Throughout the history of this country, much has been written about a free press and what its democratic implications are. This has been especially true during the last twenty-five years and yet, adversely, this period has been marked by considerable stifling of a free press. By a free press dealing with pharmaceutical affairs, one should expect, at least, an unbiased recording of the favorable and unfavorable actions and accomplishments of pharmacy in all of its aspects—educational, professional, and commercial. The writer, in his professional reading within the last few years, has encountered several items of journalistic reporting which have forced him to ask the question heading this article. These items were conspicuous by their absence in the pharmaceutical press where he would naturally expect to find them.

The first item was reported several years ago. It cites a case where a reliable pharmaceutical house was found guilty of restraint in trade involving *an important medicament* which has proved a godsend to a fairly large group of sufferers. This was not reported in the pharmaceutical press but the information was found in the chemical press.

Quite recently another reliable manufacturer of pharmaceuticals was fined a substantial sum for misbranding of a drug in violation of the Federal Food, Drug, and Cosmetic Act. In this instance fifteen deaths resulted. Again this information was obtained from the chemical press and to this day the writer has not seen a report of it in pharmaceutical literature. A survey of the Notices of Judgment of Federal Security Agency reveals violations of the above act which are seldom reported in the press concerned with our profession.

What is the reason for such a biased press which reports so voluminously of all of the favorable happenings and a minimum of the unfavorable ones? The answer seems quite simple since an examination of the current pharmaceutical journals reveals that a majority of them are operated for profit. This is evidenced by the fact that a great number of these publications obtain their revenue from advertising pharmaceutical items and this bulk is sometimes so extensive as to

obscure the worth-while reading matter contained therein. It would seem, therefore, that if we are to be assured of the respect of other professions, we must dignify ours by having a press which reports the pharmaceutical news, without equivocation, whether we like it or not.

Henry M. Burlage,
University of North Carolina

Limitation of Enrollments

At the very beginning of this discussion of the subject of limitation of enrollments in colleges of pharmacy, it might be well to point out that the writer is in complete sympathy with the basic and underlying principle of such a proposal, viz., that the profession as a whole will eventually suffer if the colleges insist upon graduating trained personnel in restricted numbers. However, it is not believed that an arbitrary ceiling such as is now proposed will serve as the solution to this problem. Several reasons can be cited for this belief.

First, limitation of the size of the freshman class automatically sets a quota of entering students, and we are all more or less reconciled to the fact that quotas are to be met. This will be no handicap in the more lush years when some selection of material will be possible. But it is entirely conceivable that there might come a time when, in order to meet that quota, it will be necessary for a school to lower its entrance requirements to bolster its enrollment to the allowable limit. This serves as a boomerang since most instructors feel that they must justify large numbers of failures in their courses and, rather than expose themselves to the possible embarrassment of such a position, they will consider it necessary to teach down to the average level of the class, thus failing to stimulate the more able students to the full exercise of their capabilities. In what way has the profession been benefited in such a situation?

Second, limitation of the size of the freshman class is meaningless insofar as eventual control of the number of graduates is concerned because many schools, ours among

them, admit students with advanced standing at the beginning of the sophomore year. This creates a neat subterfuge for evasion of the spirit of any such regulation while still adhering strictly to the letter of the ruling. That is, any students over and above the permitted number can be advised to register for the first year in the liberal arts college, or its equivalent, taking those subjects which will equip them for unconditional admission with advanced standing. Under these circumstances, what has been accomplished by limiting the size of the freshman class?

Third, limitation of the size of the freshman class will not accomplish its intended purpose because, if the proposed system of limitations works ideally and each college is permitted to fill its quota with students showing high potential ability, then it follows that fewer of the students will fall by the wayside during the ensuing years. The result will be a distortion of the present student mortality curves, upon which the proposed system of limitation is based. As a further result, the number of graduates from each school will rise and this, in turn, would seem to tend toward the dreaded flooding of the field.

Fourth, it is difficult to imagine on what basis, other than capacity of classrooms and laboratories, tax-supported institutions can justify any limitation of their services to the tax payers of the state. Thus the entire matter becomes the individual concern of each school, to be determined by them in terms of physical facilities, present and future demand for the services of its product, expansion of services in the territory affected, versatility of the curriculum, etc. In no case is it conceivable that the answer for any particular school can come out of a survey of national or even regional statistics.

Fifth, and entirely apart from the above, it is the considered opinion of the writer that any arbitrary skimming of the mental or economic elite for the purpose of specialized training, and at the expense of the slower, possibly more plodding but none the less sincere individual who must handicap himself scholastically by devoting a goodly portion of his free time to such employment as will aid him in defraying the cost of his education, is entirely contrary to the basic democratic principle of equal educational opportunities for all. That is,

if facilities permit, any student should be given the opportunity of proving that he does or does not have the qualities and capabilities demanded by the profession of his choice. On the other hand, if he does not have them he must be eliminated regardless of the number of other failures in the same class. In this way he will have been effectively blocked from entry to the field, but will have had the opportunity of proving to his own satisfaction that it was not for him in the first place.

In conclusion, it is not believed that limitation of enrollments in the colleges of pharmacy will in any way help to raise the standards of the profession. Rather, a rigid and continued selection of students coupled with elimination of the unqualified, and sincere inspiration as well as capable instruction of those who remain is the only means by which this goal can be attained.

George E. Crossen,
Oregon State College

The Significance of the Subordination of Latin Titles to English Titles in the U.S.P. XIII and N.F. VIII

Latin as a dead and universal language has long been regarded as the basic language of science. From it, either directly or indirectly through the ancient Greek, more than 60 per cent of our English words have been derived. Since the days of the Roman Empire, alike with ancient Greek, it has undergone changes, and new words have been coined and added to its vocabulary, many of these by scientists in the medical, pharmaceutical and biological fields. Some of these new words have been formed by adding Latin endings to the roots of English names. While such may be regarded as "bastard Latin," they could equally be designated as a part of the body of "modern Latin." Most of the Latin names of organic and synthetic chemicals in the present Pharmacopœia and National Formulary and many of the Latin names of plants and animals belong to this category.

One of the arguments advanced by proponents of the subordination of the Latin titles to the English in the coming revisions of the U.S.P. and N.F. was that most of the official Latin titles are bastard Latin. What of it, as long as these Modern Latin titles subserve their purpose? How strange our eminent biologists have not subordinated the Latin binomials of plants and animals to the English or other vernacular names of their native lands! What a Babel it would be, if American botanists were to assign primary English names to newly described species!

Other arguments advanced for the change were such statements as "Latin titles are not used in hospitals in written or verbal orders nor by the medical corps of the military forces; that physicians generally use abbreviations in prescription writing; the differences in some Latin titles in various national pharmacopœias; the subordination of the Latin to the native language titles in the Portuguese, French, Russian and Chinese pharmacopœias; 70 per cent of the medical schools do not require Latin for admission to the medical curriculum, the learning of Latin names for drugs lays great hardship on the medical student and doctor; and the use of Latin names in the official standards has contributed to the alienation of a great part of the American physicians from these standards."

Most of these arguments are weak and some are far-fetched and not based on factual data. The reason that some pharmacists and physicians in hospitals, etc., do not use Latin is probably owing to ignorance or carelessness. The abbreviations used by physicians have been mostly Latin ones when prescribing official drugs and their preparations. The differences between the Latin titles in some of the national pharmacopœias is not a serious problem for the pharmacist to overcome if he has resourcefulness. The usual reference works carried in the libraries of properly equipped pharmacies and pharmaceutical institutions contain the information required.

One of the weakest arguments of all for this change is that it should be made because the French, Portuguese, Russian and Chinese pharmacopœias have subordinated the Latin to that of their native tongue. The great majority of the pharmacopœias of the world use Latin as their primary titles, so that prescriptions written by physicians for most of the items

found in them can be readily interpreted by intelligent pharmacists in any part of the world. Since many pharmacists are not versed in Portuguese, French, Russian and Chinese, prescriptions in these languages become a nuisance to decipher.

Granted that 70 per cent of the medical schools now do not require Latin for admission to the medical curriculum, it is probable that the majority of their matriculates, nevertheless, had at least high school Latin. How a medical student can make satisfactory progress in anatomy, bacteriology, pathology and pharmacology without knowing some Latin is difficult for a former medical student to comprehend.

The Latin names of drugs and preparations are surprisingly few when compared with the hundreds of Latin terms the medical student must encounter and understand in the texts used while pursuing the medical course. There should be no real hardship involved in learning the Latin names of drugs in the pharmacopœia and formulary.

The adoption of English titles as primary titles in the U.S.P. and N.F. was unnecessary and a step backward in the advance of pharmacy and medicine. It no doubt was occasioned by the distaste for Latin by some members of the health professions in positions of influence and by the preference of some chemists in control laboratories for vernacular names owing to their unfamiliarity with Latin.

The effect of the change may be to encourage many of the younger doctors to write their prescriptions in English or tell their patients what to buy for their ailments from the pharmacist. This would be likely to detract more from the prescription compounding of pharmacists and encourage self medication.

It is, indeed, fortunate that Latin abbreviations as well as Latin titles have been retained, even in secondary position, for the use of those prudent practitioners preferring them and for those not wishing every patient to know the identity of what is being prescribed, when such knowledge might be detrimental to the patient's welfare.

It is unfortunate that, at a time when our statesmen are emphasizing the need for international understanding and cooperation, at a time when the great majority of the national

pharmacopœias use Latin for their primary titles, and when, after years of progress in the unification of pharmacopœial titles (in Latin) by the Commission of Pharmacopœial Experts of The League of Nations, that we should choose to stand with the small minority by emphasizing our own provincial titles.

Heber W. Youngken,
Massachusetts College of Pharmacy

The American Council on Pharmaceutical Education revised its standards for the accreditation of colleges of pharmacy on April 7, 1945, and also its roll of accredited colleges. The booklets containing this material have been distributed to the college deans. The Council has been giving thought to the matter of limiting enrollments in colleges of pharmacy, but will look to the A. A. C. P. for guidance in this regard. The Council is also eager to begin reinspection of colleges and is now considering the policy which should be pursued in this regard during the period of restricted travel.

The American Council on Education, through the cooperation of the Office of Inter-American Affairs has recently completed assembling thirty-three teaching units of 2x2 color slides dealing with other American republics. Complete files of these units have been placed on deposit with a number of institutions throughout the country, or the individual sets or the entire collection may be purchased from the Council at 744 Jackson Place, Washington 6, D. C. Some of the units, such as "Hunting Unusual Plants in Guatemala," "Native Markets of Latin America," and "Rubber in the Amazon Basin," may be of special interest to colleges of pharmacy.

One of the most commendable and far seeing acts for which The American Foundation for Pharmaceutical Education is responsible is a study looking towards the need of teachers in the pharmaceutical field in the post war days. The study which was well done was made by Dean A. G. DuMez, Secretary of the American Council on Pharmaceutical Education and is printed in this issue. Of this study, Dr. E. L. Newcomb, Secretary of the Foundation says, "The Foundation had this survey made as one of several activities to determine the needs of pharmaceutical education in the future. The results clearly indicate not only a big job to be done in graduate training to produce personnel for teachers in our colleges of pharmacy for the future, but also a splendid opportunity in the pharmaceutical teaching field.

"Our Foundation Board of Grants has nearly completed the work of preparing the procedure and forms to be used for the award of feilowship grants. These forms will be sent to the deans in the very near future."

The President's Page

For a number of years we have congratulated ourselves on the conquests made in the area of pharmaceutical education. The advances seem great, however, only because we started from a very low level and not because we have climbed high. In the material that follows, I am setting forth a limited sketch of some curricular problems observed during more than two decades of teaching and about which I have rather strong convictions. It is my hope that others will contribute ideas on the basis of their experience and convictions so that from the whole we may develop a program of greater potential value to our students and society.

Planning Pharmacy Curriculums

Pharmacy Education Broad in Scope

A school of pharmacy is primarily a professional school. As such, it must direct its efforts to the adequate education of students in the sciences and technics comprising the fundamentals of the various professional areas. It should be possible to narrowly delimit the scope of education in a professional school to the required technical skills.

It should be the function of our high schools to train for citizenship. Until they do so, however, our colleges must assume this added responsibility, at least on a temporary basis, for success in a profession depends in no small part upon the ability to assume responsibility and deal intelligently with social and economic problems. If a pharmaceutical education is to offer the student the maximum opportunity for self development and a satisfying personal life, it must provide an experience as broad and rich as possible in those areas of learning which are a universal part of the culture. The pharmacy school has, therefore, a responsibility to provide those elements of a broad general education which are most essential to the functioning of the pharmacist as a cultured and intelligent citizen.

From the standpoint of the individual student the educational experience should be directed toward the attainment of broad competence. From the standpoint of educational organization, however, it is convenient to distinguish two areas, namely: the specialized or technical education area and the

general or liberal education area. General education is not a very specific term but it is about as descriptive as any term that can be applied to the non-professional and non-technical areas of education which it is presumed should be the common possession of educated people. General education is so broad in scope that it is difficult to define clearly the specific objectives to be reached or to outline the scope of the study to be included. Certainly no clear-cut agreement has emerged regarding the scope and content of general education. Perhaps no clear definition can be achieved and the field of general education must always necessarily be of a dynamic and shifting pattern. This absence of clear definition makes it imperative that we avoid a fixed or rigid plan and that those responsible for planning in each school give careful thought to the student needs and the facilities of the school for satisfying those needs.

Objectives of General Education in a Professional School

In formulating the objectives of general education in a professional school, two reports are particularly worthy of attention, namely: American Council for Education, *"A Design for General Education,"* Series 1, No. 18, Washington, D. C., 1944, and Society for the Promotion of Engineering Education, "Report of the Committee on Engineering Education After the War," 1944. These reports and other literature indicate that a general education in a professional school should be directed to the substantial development among students of: 1. the ability to read with understanding and to express ideas accurately and clearly in oral and written English; 2. the ability to read, understand, and think intelligently about contemporary social and economic problems; 3. to understand the historical development of American institutions and international relations; 4. to appreciate the chief forms of culture as evidenced in literature, music, and the fine arts; 5. to understand human behavior so that sound personal adjustments can be made and so that problems of human relationships may be handled intelligently; 6. to understand the basic principles of science and technology and their role in the modern world; 7. to understand the necessity of maintaining personal and community physical and mental health; 8. to understand and appreciate the ethical and social concepts necessary for a satisfying personal and professional philosophy of life.

General education for each student in part is an outgrowth of the total university experience and consequently in evaluating a program, the non-curricular activities of students must be carefully appraised. Certain objectives in the appreciation of human relationships are conditioned by living arrangements, recreational facilities, the pattern of student organizations, etc. Although it is difficult to assess the value of these aspects of university life they are of far reaching significance and require consideration in any plan. It cannot be expected, however, that the objectives of general education will be attained through extracurricular activities of student life. Many of the objectives can be attained only by systematic and specifically directed education.

Re-planning of Professional Curriculums

The vitality of professional education in a dynamic society is dependent upon the continuous and careful modification of the curriculums to meet changing demands. The present period in which many curriculums have been altered to meet the demands of war is well suited to re-planning.

It is obvious that the ultimate evaluation of any program of professional education should be determined by analysis of the skills and knowledge demanded of the worker. The application of this simple principle requires that attention be directed constantly to current demands and to anticipated future needs growing out of new developments. In re-planning the curriculums, it is suggested that consideration be given: 1. to estimating as accurately as possible the number of people who will need to be trained in a given area; 2. to determining the curricular areas most in need of strengthening; 3. to determining new areas of training which will need to be treated because of contemporary developments.

The re-planning of professional curriculums should have as its ultimate objective a total program of education directed toward professional competence, personal development, and intelligent citizenship. It should recognize different areas of professional education. For pharmacy these areas may be divided into: 1. the practitioner or retail pharmacist area; 2. the hospital or strictly professional area; 3. the laboratory or technologist area; and 4. the research area. One of the major responsibilities of each school then becomes the selection or guidance of students into those areas suited to their

aptitudes and interests. These areas can be incorporated into a single flexible curriculum. Since all professional programs are not of equal difficulty, and do not draw students of comparable ability, it is evident that adequate training in most areas cannot be incorporated into four years. It seems logical then to establish a minimum curriculum of core subjects which will establish a basis from which each student may specialize. A tentative curriculum of this type is outlined.

A FLEXIBLE CURRICULUM

Core subjects

Subject	Minimum semester credits
General Education	
English Composition	3
Speech	3
Government	3
Algebra and Trigonometry	6
General Chemistry and Qualitative Analysis	6
Organic Chemistry	6
Quantitative Analysis	3
General Physics	6
General Bacteriology	3
General Biology	6
Physiology	3
Professional Education	
Applied Pharmacy	
General and Theoretical Pharmacy	6
Dispensing Pharmacy	8
Manufacturing Pharmacy	8
History and Ethics	3
Pharmaceutical Biology	
Pharmacognosy	6
Pharmacology	6
Biological Products	3
Biological Assaying	3
Pathogenic Bacteriology	3
Pharmaceutical Chemistry	
Drug Analysis	6
Organic Medicinal Products	3
Physiological Chemistry	3
Electives to make	128

The plan contemplates a minimum of 128 semester hours for graduation. Divided into 16 credit hours per term it contemplates that the normal student will be required to devote a 48 hour week to classes and study. The superior student may be able to carry 2 or 3 additional hours per term and thus specialize to a considerable degree at the B. S. level. The inferior student may find it necessary to give 64 or more hours to classes and study. It should be emphasized that the credits assigned to subjects are minimums and each school may wish to require additional credits in one or more subjects. Many schools will find it necessary to include physical education and military training in the curriculum.

The plan intends that English composition, a knowledge of the fundamental principles of physics. etc., are as much a part of the education of a competent pharmacist and citizen as is dispensing pharmacy. Certain of the subjects listed under General Education might be taught as applied subjects. The plan recognizes the increasing importance of biology and chemistry as the sciences which have emerged to a position of leadership in the health sciences field; it also recognizes the growing importance of organic and biological chemistry, of bacteriology, and pharmaclogy, and the declining importance of pharmacognosy and galenical pharmacy. It also recognizes the right of each student, faculty, and school to some degree of autonomy in the construction of the program of study or curriculum. It makes possible the minimum qualification for the practice of pharmacy in four years by a normal student pursuing a 48 hour week of studies, while permitting the superior student to specialize by means of a heavier credit program. It is expected that many students wishing to specialize for retail pharmacy, hospital pharmacy, laboratory positions, etc., would devote additional terms or years to the completion of a program of study. It paves the way for a transition from the four year to the five year course, and if there is a demand for the latter, it will become evident from the number of students electing additional subjects. There is no reason why a student taking sufficient courses at an advanced level should not earn the M. S. degree. The plan and the staff organization proposal which follows contemplate graduate instruction. The core subjects with suitable electives form a substantial basis for graduate work. Every school would not need to prepare its graduates for all areas.

The plan suggested is open to many criticisms. Some will object to the titles and credit allotments. The titles are quite immaterial except as they enable us to understand each other, for teachers make the content of a course what they will irrespective of the title. The minimum credit hours are liberal if students are held to an honest three hours of work for each credit hour and courses are well coordinated. Some would have the exact division of hours between didactic and laboratory hours set forth. Again, this is of secondary importance; we must first determine the minimum essentials and then allocate the time between theory and technic.

The following fields are suggested as additional subjects from which additions might be made to the general educational program of a student. Obviously this list might be extended or reduced depending on institutional offerings.

General Education Electives

- English Literature
- History
- Modern Languages
- Psychology
- Sociology
- Economics
  - Accounting
  - Business Administration
- Mathematics
- Physical Education
- Military Training

Technical electives might be as diverse as the resources of a school permit. Suggested technical electives to which many additions might be made are:

Technical Electives

- Biology
  - Zoology
  - Advanced Physiology
  - Serology and Immunology
  - Anatomy
  - Pathology
  - Public Health and Sanitation
  - Entomology
- Chemistry
  - Analytical
  - Physical
  - Colloid

Chemical Engineering
Pharmacy
Economics
Jurisprudence
Marketing
Hospital Pharmacy
Advanced Manufacturing
Pharmacognosy
Advanced
Mycology
Pharmacology
Advanced

Addition to Staff and Divisions of Instruction Needed

The plan suggested or any equivalent plan would demand an elaboration and expansion of the faculty organization in many schools of pharmacy. Based on the recommendations made by Dr. A. G. DuMez in the report of the A. C. P. E. (see this Journal, October, 1944, p. 598) and the suggested flexible curriculum a school of pharmacy having available the necessary academic staff for general educational sudbjects, including departments of English, modern languages, mathematics, history and government, economics, social sciences, biology, chemistry, physics, business, physical education and military training, might be organized as follows:

DIVISIONS OF INSTRUCTION

Pharmacy	Biological Sciences	Chemistry
General and	Bacteriology,	Organic and
Theoretical	Serology and	Biochemistry
Dispensing	Immunology	Analytical
Manufacturing	Pharmacology	Physical
Hospital	Pharmacognosy	and Colloid
Commercial	and Mycology	Chemical
	Public Health	Engineering
	and Sanitation	

Each division of instruction should be headed by a specialized staff member.

Some institutions with available divisions of instruction in such subjects as physical and colloid chemistry might not need added professional school staff members for such instruction. It should be emphasized, however, that pharmacy schools have always been understaffed and without sufficient competent specialists. Although some combining of subjects under a given teacher may be necessary or desirable, it is believed that a staff of specialists with an adequate number of part time assistants are desirable in a faculty organization.

A flexible curriculum covering the areas indicated and taught by a staff of specialists would require correspondingly increased laboratory, office, library and research facilities. It would also require the modern equipment and apparatus needed to teach modern science and technology. Our schools of pharmacy must acquire these facilities if they are to give a sound professional education.

Glenn L. Jenkins

ITEMS OF HUMAN INTEREST

On June 18 Frederick K. Smyithe, son of Mr. and Mrs. C. E. Smyithe of the College of Pharmacy, University of Minnesota, was ordained a deacon in the Holy Trinity Episcopal Church.

Dean Charles H. Rogers of the University of Minnesota has been crowned billiard champion of the Faculty Club.

Dean Emeritus and Mrs. F. J. Wulling are spending the summer at their lake home on beautiful Christmas Lake near Minnetonka.

Dean D. B. R. Johnson of the University of Oklahoma attended a meeting of the Pharmacy Corps Committee in Washington on May 6.

Gordon Heaney Barrett, son of Professor and Mrs. Leslie B. Barrett, University of Connecticut, has been awarded a scholarship and will enter Yale University at the opening of the next term. Gordon has been a frequent attendant at the Plant Science Seminar and the annual convention of our Association.

Dr. Rufus A. Lyman, Jr., the older son of Dr. and Mrs. R. A. Lyman, University of Nebraska, was graduated with Alpha Omega Alpha honors at the May commencement and began his internship in the United States Naval Hospital at San Diego on June 26. He has since been transferred to Naval Hospital No. 8 at Pearl Harbor. Dr. Edwin D. Lyman, the younger son, completed his intern service in the hospitals of the Medical College of Virginia on June 30, and began his residency in the Vancouver General Hospital, British Columbia, Canada, on August 1.

Charles R. Bohrer has resigned the position of Assistant Secretary of the American Pharmaceutical Association and returned to his store at West Plains, Missouri. Mr. Bohrer was called to this difficult task in 1942 and he has carried on and completed it with credit to himself and for the welfare of pharmacy. We welcome him back to the middle west where he belongs. It would be unfortunate for the nation if some of Missouri's first class citizens were not returned to take care of the home front. Mr. Bohrer must take a great deal of satisfaction, and rightly so, at the completion of his service.

The Editor's Page

Many times, in recent months, we have mentioned the fact in these pages that this is a time for rejoicing because of the status of pharmacy. As the days go by event after event takes place which substantiate this view. The latest is the Connecticut incident. In that state, an effort was made in the 1945 legislature, to defeat the purpose of the present pharmacy law. If this had been done the educational standards in Connecticut would have been lowered. What is difficult for us to understand is the fact that the proposed reactive legislation received the support of some of the pharmacy officials in the state, but it did not have the support of the thoughtful retail druggists of Connecticut. Neither did it have the approval of the laymen. In fact, both retailers and the laymen came to the support of pharmaceutical education and practice and the proposed legislation was defeated. Again we can say that pharmacy is safe in the hands of the retail druggist and Connecticut has demonstrated to the nation that the laymen want a pharmaceutical profession with high standards of training.

The legislature of New Mexico, during the 1945 session, appropriated funds for the creation of a college of pharmacy within the state university at Albuquerque. This is another indication of pharmaceutical progress. There are those who think there are too many schools of pharmacy in America. We have never thought so. The number is not excessive but the distribution is at fault. We hold that every state needs a college of pharmacy in its educational system. It should be an intellectual and spiritual center for the professional activities in the state. Its curriculum and its research program should mould professional and public opinion not only in the state, but it should make a contribution to pharmaceutical education in the nation as well. Moreover, a college of pharmacy as a part of a state's educational system not only raises the morale of the profession in that state, it creates a pharmaceutical consciousness in the public which supports it and which it serves. The legislature and the University of New Mexico are to be commended for their vision by establishing a college of pharmacy in that vast southwestern region so rich in min-

ing, agricultural and animal husbandry possibilities the development of which is still in its infancy.

At last the question of whether to hold or not to hold the annual meeting has been settled in conformity with the government's request. Perhaps it was the expedient thing to do but educationally it is poor policy to place horse racing and sports before scientific, educational, and religious war and post war planning. Now that it is done we are calling special attention to the requests made by President Glenn L. Jenkins in the current issue of the *Journal*. The work that would have been done in convention will have to be done without the benefit of personal contact which the convention affords and it is now more important than ever that we communicate through the medium of the *Journal's* pages. If the officers, the committee chairman and members and all of us as individuals comply with President Jenkins' requests, the *Journal* can be kept up to its usual standard. May this year be the last one in which we fail to hold a convention.

Word comes that a new organization, "The American College of Pharmacists," has been incorporated under the laws of California. Dean Alvah C. Hall of the University of Southern California is temporary president. The purpose of the new organization as stated is to "promote the professional aspects of pharmacy above today's practice." Dean Hall says "The opinion expressed by many of the founding members is that they will not be in business long enough for the results of this new organization to distinctly benefit pharmacy but they want to leave the profession in a more respected position than they found it in order that the youth of today may gain greater public recognition for their professional service to the community." And further "we expect to be of assistance to members of the association in keeping them up to date on scientific literature and pharmaceutical practices; also to present scientific programs for their improvement in practice; to institute a program of refresher course work and encourage

the establishment of ethical practice benefiting the entire profession." Again there are those who think there are too many pharmaceutical organizations, especially those of a national character. This again we question since every national organization has its specific field of endeavor. What we have hoped for is one national organization that might be representative of all of American pharmacy, and we believe that is gradually being accomplished. But this new organization in California is distinctly a local affair. A grass roots organization of local pharmacists and the amazing thing about it is that there were one hundred pharmacists who would each contribute one hundred dollars for the cause of improvement of the profession of which they are a part. This is local organization with a vengeance and the more localities that have this kind of an organization the sooner the complexion of pharmacy will change in the esteem of the public and the other health professions, and the stronger our national associations will become.

The birth of another organization, "The American Association of Government Pharmacists," has recently been announced. The membership is open to all pharmacists in the government service. The objectives of the organization are "to support and work for anything that will benefit government pharmacists and the departments they serve" and "to stimulate membership in the American Pharmaceutical Association as well as state and local bodies." Such an organization would seem to supply a real need and should be helpful in improving both the service and the standing of pharmacy as a profession in the government service as a whole.

The formation of both of these organizations is an indication of pharmaceutical progress.

Temple University, at its June commencement, conferred upon Dr. Ernest Little of Rutgers University the honorary degree of Doctor of Laws. No man in the educational group carries that degree more deservedly than Dr. Little. His contributions to pharmaceutical education and to the profession are so well known they need not be tabulated here. The granting of this degree by a great university is one more indication of pharmaceutical progress. Dean Kendig calls attention to the

fact that we have been negligent in not placing before degree granting bodies the names of men in pharmacy who because of their accomplishments are worthy of distinguished recognition and we think he is right. The granting of this degree to one of our number has a greater significance than the recognition of the recipient. It is a recognition of the progress of pharmaceutical education.

The retirement of Dean Robert C. Wilson of the University of Georgia and Dean Charles E. Mollett of the State University of Montana removes from active administrative work two of the most colorful workers in American pharmacy. Dean Wilson has been a standard bearer of idealism not only in Georgia but in the nation as a whole. While Dean Mollett has not been as active in national pharmaceutical work, he organized the school of pharmacy in Montana a quarter of a century ago and has been the guiding spirit which has built an outstanding institution in that vast empire which is Montana. Both of these men can say in the language of St. Paul, "I have fought a good fight, I have kept the faith." We shall remember them in our counsels and we hope they can be with us in our comings together. Dr. W. Taylor Sumerford succeeds Dean Wilson and Dr. C. H. Waldon is Dean Mollett's successor, and to these virile and scholarly young men, the Association extends a hearty welcome. Along with them, we welcome the newest of deans, in the newest of colleges, Dean Roy A. Bowers of the University of New Mexico. In most of our states where pharmacy has been a part of the state system for some time the pattern is pretty well set but Dean Bowers has the intriguing opportunity of cutting his own design in a region where the opportunities for pioneering are great. We congratulate him on his opportunity.

Rufus A. Lyman

NEW IN THE FAMILY

Margo Ruth Cwalina.—Born May 7, 1945, daughter of Capt. and Mrs. G. E. Cwalina, Creighton University, College of Pharmacy, now stationed at Ft. Lewis, Washington.

Peter William Kirch.—Born May 19, 1945, son of Dr. and Mrs. Ernst Kirch, University of Illinois, College of Pharmacy.

Jane Marie Walsh.—Born March 23, 1945, daughter and fourth child of Prof. and Mrs. Robert A. Walsh, Massachusetts College of Pharmacy.

Gleanings from the Editor's Mail

A word of commendation for the April *Journal* and for the excellence of the generally higher and advancing thought it expresses, should be voiced, and so I voice it.

The nature and tenor of the several articles justify the conclusion that pharmacy is now, though belatedly, entering upon a period of harvesting from the seeds sown so sparingly by all too few sowers in the past half century. Many of the sowers are no longer here to enjoy the harvest. A few still remain to share the joy in the heritage pharmacy is on the verge of enjoying or is already enjoying. Those who are to benefit from the reaping of what their predecessors have sown will in turn plant the seeds for a richer harvest for their successors. Thus advancement proceeds and accelerates during cycles of development. Pharmacy is now definitely in a cycle of development and now is the time to stimulate and spur advancement to make up for the loss of time up to 1932 when the minimum four year course went into effect. I believe the present upward trend will soon establish a minimum five year course and then such higher undergraduate and graduate courses as are needed to give pharmacy an educational parity with any other profession. Specialized and combination courses will include pharmaceutical engineering now advocated by Arthur F. Peterson in his admirable article in the April *Journal*. I was agreeably surprised to learn from this article and from Mr. Peterson's letter that so many of our leaders are now joining their elder colleagues in the realization of what pharmaceutical education needs in ascending degrees because of the culminating necessity of the recognition of these needs in the educational administration now demanded by the times. Much of the work begun by a few a long time ago is now bearing fruit. Dr. Kendig so rightly and graciously says on page 188: "It is true that the Pharmaceutical Corps objective was realized only in 1943 but there was a tremenous amount of constructive work done in preceding years." Something similar will soon be said when the five year and higher courses will have emerged from their period of incubation. Some of these periods are longer than they need or ought to be. As an example, it would be stated the pharmaceutical engineering course advocated by Mr. Peterson for the past fifteen years. was among the combination courses (teacher and large scale manufacturing were the others) I proposed forty years ago and which the University of Minnesota would have established had there been any support. Corresponding at the time with many manufacturers, wholesalers and others brought a single supporting reply and that was from the present Squibb factory superintendent Nitardy, be it said to his credit.

Our current literature and especially the numerous letters I received from the younger men, indicate a growing acknowledgment of the need of the better foundational administration now on the horizon. The *Journal* and your editorial work are contributing much to this awakening.

University of Minnesota,
May 20, 1943

FREDERICK J. WULLING,
Dean Emeritus.

After receiving your request for my opinion as to "the wisdom of abandoning our pharmacy meetings in war time," I perused the proceedings reports of several such meetings to determine what actions had been taken. It seems to me that few, if any, of those actions were such as could be called "vital to the war effort." In fact, it seems that most of the business might have been (or was) transacted by mail and the committee reports and the orations printed, if necessary. Of course, an oration *sans orator* is pretty dull, but for the most part we remember how he said it and rely upon the printed report for accurate information.

I am of the opinion that the opportunities to "get away from it all," renew acquaintanceships and gain inspiration from what others have done are among the more important advantages of our meetings. But these come under the heading "business as usual" and it is obvious that business is not, in wartime, "as usual."

I realize that there is need for discussion of our various problems, but I do not feel that we must further disrupt public facilities to do so.

University of Michigan
April 24, 1945 E. L. CATALINE

You ask me what I think of the wisdom of abandoning our pharmacy conventions during the war.

I think there is a great need for pharmacists, as well as teachers, to attend these conventions, especially the younger pharmacists and teachers, in order that they may early have the benefit of observing and participating in organization work, of preparing and delivering papers, and to have the greater benefit of meeting and exchanging views with people from the different parts of the country who are interested in the same phases of pharmacy—for example, the Teachers Conferences of the American Association of Colleges of Pharmacy and the different Sections of the American Pharmaceutical Association. One may always read the published reports and proceedings of meetings, conventions, etc., or perhaps get garbled information from some one who has attended, but these are insufficient for the person who is vitally interested in the organization work of his chosen profession.

To be sure, traveling is not looked upon with favor by our government officials, but every week when we look in the society columns of our local papers we note that many people have enjoyed a month in Florida, have been to New York, or are preparing to spend some time on Cape Cod or at Atlantic City. They travel and the pharmacists should also have the privilege of traveling to necessary meetings and conventions. Here's hoping that all of our war restrictions will soon be a thing of the past.

School of Pharmacy,
University of Maryland B. OLIVE COLE

Regarding your comment on the importance to pharmacy of recognition by our great universities of the achievements of pharmaceutical educators, I do not think our deans have paid enough attention to the matter of honorary degrees for men who have achieved distinction in the field of pharmacy. We have plenty of men whose work and contributions to the profession and to society fully warrant recognition by honorary degrees. Nominations for such honor is our responsibility.

I cannot think of any thing which would do more to make pharmaceutical educators favorably known to other university educators than the granting by our universities having schools or colleges of pharmacy in the campus ensemble, of honorary degrees to carefully selected worthy recipients.

I find as I compare the records of men I have on my list for consideration, that their records compare favorably with the listings in citations used in other colleges and universities or on our own campus.

Temple University
June 29, 1945

H. EVERT KENDIG

(To Dr. Heber W. Youngken)

I am very glad that you took the time to tell me how you feel about the suggested change of emphasis as to the official Latin and English nomenclature. You may be sure that I did not take the matter lightly. Brought up in the continental European humanistic or, if you like the term better, classical tradition, I had to fight my own sentiments in order to get to the conclusions which, in my opinion, are cogent and have to be drawn from the historical development.

It was heartwarming to learn that to you like to myself it has not been dogmatism of whatever kind that has influenced or even molded our opinion but that both of us, although arriving at different conclusions, have been directed by the same motive: our concern for "the Art of the Apothecary" or, to put it in another way, for the best possible utilization of the special service pharmacy is able to and should be enabled to render to society.

It is a truism that it is not the desires and the philosophy of the pharmacists that decide the scope, the way and the means of the pharmaceutical services, i. e. the practice of the "Art of the Apothecary," but the demands and the philosophy of society.

I pointed out in my article on "The Place of Latin in the Official Standards of Pharmacy" that and why the philosophy of our present society in general and of our physicians in particular does not favor the use of Latinized terms in prescriptions and that there is no basis for the hope that this attitude may be reversed. The more the physicians, not willing to learn and to keep in mind the Latinized terms, prefer the prescribing of ready made industrial preparations to the composing of individual prescriptions, the less will there be an opportunity for the

practice of the "Art of the Apothecary." In other words, the practice of this art does not depend on the language in which individual prescriptions are written, but whether or not they are written at all. The situation can hardly become worse. There is, however, much reason to believe that the use of the official standards by physicians, hence the incentive to compose individual prescriptions, will increase if the headings of the monographs present to the physicians the same terms they are used to encounter in the medical literature, i. e., English terms. I personally am definitely of the opinion that the English headings will not only, as you say, "encourage more physicians to write their prescriptions in English," but will encourage more physicians to write prescriptions.

Certainly there will be cases in which some smart people will try to buy the ingredients written in English in order to save some money by being their own apothecaries. These cases, however, will be rare, and the pharmacists will certainly be aided by the physicians in discouraging such attempts.

More than a century of experience in France has shown that the use of vernacular terms in prescriptions has not been detrimental to the "Art of the Apothecary." On the contrary, it is a fact that there is scarcely another country in the world in which the individual prescription is still so customary as in France, and the scientific and social standing of the French retail pharmacist has not been surpassed anywhere.

I do not think that the practical recognition of facts, actual as well as psychological ones, like the obvious impossibility of achieving an international, uniform and adequate Latinizing of chemical terms can be regarded as a meek capitulation to some group of people. In my opinion, it is rather a brave act requiring courage and determination.

It is certainly true that the Latin names for drugs of botanical or animal origin enjoy much more international uniformity than those of chemical drugs, although there too are differences. I refer, for instance, to the U.S.P. name "hyoscyamus" for the dried leaf of henbane which is called "folia hyoscyami" in the German pharmacopœia and "hyoscyami folium" ("folia") in other official standards. Your suggestion to use "the Latin generic name or Latin binomial of the plant or animal yielding the drug" will certainly be heeded. As a matter of fact, the "English" terms for important drugs of botanical origin in the U.S.P. XII represent such names, for instance, belladonna, digitalis and hyoscyamus (the terms deadly nightshade, foxglove and henbane being listed as "common" names). But that you know better than I do.

As to our Latin-American neighbors, I think we will continue to issue Spanish translations of the U.S.P. and to include comparative lists of English and Spanish titles in the English edition. (See U.S.P. XII, pp. VI-XIX.) That seems to me even more apt to exclude mistakes than the maintenance of so-called Latin titles which are often different from those in the Spanish pharmacopœia.

After all nobody is advocating the abandonment of the Latinized terms from the official standards. They will continue to serve in an explanatory capacity and be at the disposal of those who think it advisable to use them.

University of Wisconsin
January 15, 1945

GEORGE URDANG

Pharmaceutical Education on the March in War Time

University of California, College of Pharmacy.—Plans are being made for post war expansion of housing facilities. New quarters have been installed for the spectrographic laboratories which are now complete with modern equipment and several research programs are already in progress. These laboratories also render a service to the analytical demands of medicine, dentistry and pharmacy.

University of Colorado, College of Pharmacy.—New cabinets have been constructed in the laboratories and in the stock room which greatly improve the appearance and provides space for the protection of equipment and supplies. New electric outlets have been installed for each desk and new hoods will be installed before the opening of school in the fall. A number of pieces of important apparatus for special laboratory work and for research have been acquired during the year.

University of Connecticut, College of Pharmacy.—The plans of the board of trustees for the post war development of the University have just been announced. They include $300,000 for a pharmacy classroom and laboratory building to accommodate an expected enrollment of 250 students. The largest pre-war enrollment was 190.

Duquesne University, School of Pharmacy.—The faculty is at work on plans of a full scale model professional pharmacy and prescription laboratory to be constructed in Canevin Hall in the near future at a cost approximately $15,000. It will be financed by friends and alumni. Officials of the George A. Kelly Company of Pittsburgh, last December presented Dean Muldoon with a $7,000 check to help defray the expenses of constructing and equipping the new pharmacy. The University architect, Raymond M. Maslier, will supervise the construction.—On March 21, the Galen Pharmaceutical Society of Pittsburgh presented the School with a memorial plaque honoring all alumni and students who have given their lives in the service in the World War.

Ferris Institute, College of Pharmacy.—One thousand dollars was made available this year for the improvement of the pharmacy library to be used for books and journals, only. A goodly number of scientific journals have been added and four hundred dollars worth of the most recent pharmaceutical books have been purchased.—The laboratories have been redecorated throughout and plans are made to improve the lighting of the analytical chemical laboratories.—A new member will be added to the staff in September.

University of Kansas, School of Pharmacy.—The hospital-scale manufacturing laboratory has been greatly improved and modernized. The rooms have had a complete renovating. Wainscoting is mahogany red, upper walls and shelves, a pale shade of pharmacy green, and the ceiling, white.—The following equipment has been fitted with casters, thereby becoming mobile: a large and small electric powder mixers and sifters, power ointment mill, mixing tanks, autoclave, Steiner mixer. New portable equipment consists of an Ertel Bench Model Filter, a Ro-Tap mechanical sifter, a 30-gallon stainless steel mixing tank with mixer, and an Eppenbach colloid mill. Other new equipment includes a Cenco-Refrigerating Incubator, a large, direct-reading balance, and a photo-electric colorimeter. A stainless steel operating table, animal cages, and surgical instruments have been added to the equipment of the pharmacology laboratory.

University of Maryland, School of Pharmacy.—Several new fellowships and scholarships have been recently established as follows: Research fellowship in antibiotics for one year by the Wm. S. Merrell Company of Cincinnati. This is a post-graduate fellowship paying $1500.00 per year, $1200.00 of which is paid to the fellow.—The Hudnut Sales Company of New York provides a fellowship paying $1000.00 annually for two years for research in pharmaceutical chemistry and the allied sciences. The fellowship will be awarded for research in pharmaceutical chemistry, pharmacology or pharmacy.—The Vick Chemical Company of New York has contributed through the American Foundation for Pharmaceutical Education, one scholarship for four years paying $365.00 per year to a needy student who has attained a high scholastic record in high school. Miss Shirley S. Shulman will complete the work of the first year under this scholarship in June, 1945.—The Read Drug & Chemical Company of Baltimore has provided one scholarship paying $450.00 annually and has also contributed through the American Foundation for Pharmaceutical Education two scholarships of $250.00 each annually.—The Henry B. Gilpin Company of Baltimore has provided one scholarship of $300.00 and one of $200.00 annually through the American Foundation for Pharmaceutical Education.

University of Minnesota, College of Pharmacy.—About half of the large medicinal plant garden located on University Avenue is being moved to a new location adjacent to Wulling Hall and in an area bounded by the Music, Psychology and State Board of Health buildings and Eddy Hall. The garden will be landscaped with bushes and low trees and surrounded by a formal hedge. The new location will give the garden greater prominence and make it more accessible for teaching purposes.—An extensively revised curriculum will go into effect with the freshman class of 1945-46. Physics, mathematics and zoology sequence, formerly optional, will be required courses, and additional quarter of pharmacology is included, and new senior elective courses in insecticides, fungicides, and veterinary pharmaceutical products are added.—The girls' lounge has been completely redecorated and new furniture acquired.—An old drug grinder and plaster iron and wooden mortars have been placed in the museum.—A super-pressure and catalytic hydrogenation apparatus and a second Coleman Electrometer have been added to the research equipment.

University of Nebraska, College of Pharmacy.—Seminar and research courses have been added in pharmacognosy. In physiology and pharmacology new courses are being offered on the graduate level in cellular physiology, hormones and special methods in pharmacology. Work is being conducted at the various state experimental stations the coming summer with medicinal, condiment and insecticidal plants in cooperation with the Nebraska Chemurgic Program. A $600 grant has been made by the committee on Research of the American Philosophical Society for continuing research in cellular physiology.—Extra equipment for the Bancroft-Warburg micro-respirometer, an electric cooling instrument and a Chamber's style micromanipulator for cellular research, has been acquired. The entire pharmacy building has been redecorated.

University of Oklahoma, School of Pharmacy.—During the last thirty days a number of acquisitions have been made to the pharmacy library. Among these are a number of valuable books and government publications dealing with medical and pharmaceutical military history of the United States.

Rutgers University, New Jersey College of Pharmacy.—During the past year two research projects were undertaken. In conjunction with the United States Army Engineers Professor Martin Ulan developed an acid extraction method for cinchona bark. By this method the crude alkaloids can be extracted in the field, with a consequent saving of shipping space, since the whole bark need not be transported to this country. Plants utilizing the method are now being erected in several Latin American countries.—Under a Regents' grant, an investigation of the method for the determining of crystallizable alkaloids in cinchona bark is being conducted by Professors Martin Ulan and Edwin Durand. Their work is not yet completed, but so far some definite information relative to methods and conditions of precipitation for the various alkaloids has been accumulated. As pertinent information has been obtained, it has been made available to the Army Engineers in connection with their assay determinations.

Washington State College, School of Pharmacy.—Plans for a new school of pharmacy building have been completed and it is expected that construction will begin as soon as conditions permit.—Recent equipment additions include a Leeds & Northrup Universal pH Indicator and a Fischer Electrophotometer.

Mr. J. H. Baker of Liggett Drug Company, Inc., 43 Leon Street, Boston, Massachusetts, says they have in their New York warehouse, copies of the 20th, 21st, and 22nd (with supplements) editions of the U. S. Dispensatory; the 4th, 5th and 6th editions of the N. F.; the 9th, 10th, and 11th (with first and second supplements) editions of the U. S. P. which may be had for the asking by writing Mr. Baker at the Boston address.

Notes and News

University of California, College of Pharmacy.—Several members of the faculty are on leave either to join the armed forces or to carry on wartime research. Prof. W. O'Connell is with the armed forces; Dr. Eric Bellquist is on leave for civilian war work; Dr. Robertson Pratt is on part time with the research staff of Cutter Laboratories to aid in problems related to the manufacture of Penicillin.—Drs. Frank M. Goyan, W. D. Kumler, L. A. Strait and Mrs. J. M. Wells are engaged in part time work with OSRD.—Dr. W. D. Kumler has been advanced to the rank of associate professor of chemistry and Dr. John F. Oneto is now associate professor of pharmaceutical chemistry and pharmacy.—Gary Kaspel has been elected to associate membership in Sigma Xi.—The student group is small but active. Recently it has shown great interest in the newly organized Northern California Branch of the American Pharmaceutical Association. Last semester the student membership was one hundred per cent.

University of Colorado, College of Pharmacy.—Acting President R. G. Gustavson took up his new duties as the Dean of the Faculties of the University of Chicago on July 1. President Robert L. Stearns will soon return to the University.—John A Biles has been awarded the Lehn and Fink medal for excellence in scholarship and the Merck award for materia medica.—Mrs. Eleanor S. Noble received the Merck award for dispensing pharmacy.—Professor David O'Day has been touring the state the last few weeks visiting high schools in the interest of the University as a whole.—Only one candidate for the bachelor's degree in pharmacy was graduated at the June commencement.

University of Connecticut, College of Pharmacy.—Twelve pharmacy seniors received degrees at the June commencement.—Joseph Murphy was given the Lehn and Fink medal for the highest four year average and the State Pharmacy Commission prize for practical pharmacy; Eleanor Orsini received the Gavin memorial given by the Connecticut Pharmaceutical Association for having shown the greatest progress since the freshman year; The Merck awards went to J. E. Murphy and Sarkis Khazarian; the Huber scholarship, to D. Max Galinsky the Kreimendahl memorial, to Thomas Zubretsky; Ethel Gutzeit won the sophomore general excellency prize and the organic chemistry prize given by Kappa Psi; Stanley Spack received the class of 1930 prize for excellency in the freshman year and Lucille Kiermont, the biology prize given by Nu Chapter of Alpha Zeta Omega. Honors by classes went to J. E. Murphy, senior; D. M. Galinsky, junior; Lucille Kiermont and Stanley Spack, freshmen.—Wallace Fletcher White has been promoted to an assistant professorship.—According to the terms of the will of the late Luis B. Switzer, of Westport, the college of pharmacy will receive his library.—D. Max Galinsky has been initiated in the Rho Chi Society.

Creighton University, College of Pharmacy.—Nelly Nigro was the winner of the Lehn and Fink medal.—Nelly Nigro, Virginia Driscoll and Alice Appel were all recipients of the Agnes Sutherland award of memberships in the American Pharmaceutical Association.—Miss Nigro and

Miss Driscoll will be pharmacy interns in St. Luke's Hospital in Cleveland and Miss Appel in Mercy Hospital in Toledo, Ohio.—Henry Sprague, a former graduate in pharmacy and science and who for a number of years has been chief chemist for the Gland-O-Lac Company of Omaha and who has had three years' experience in the Navy, has been added to the instructional staff.—Prof. Frank Potrepka has resigned to accept a research position in a manufacturing establishment where he will be associated with his former dean, Edward D. Davy of Western Reserve. In a competitive examination for seniors of all of the Omaha high schools, Robert Busick and Betty Delancy were the successful winners of the two $200 American Foundation for Pharmaceutical Education scholarships.

Duquesne University, School of Pharmacy.—The Lehn and Fink gold medal, highest award, for general excellence, was awarded to Sister M. Francine Hensler, O.S.F. She also won the Merck award for excellence in dispensing pharmacy, and an A. Ph. A. membership for excellence in the department of materia medica.—The Becker Prize, A. Ph. A. membership, for excellence in the department of pharmacy, was awarded to Sister M. Denis Bost, O.S.F. She received the Canter prize of $25.00 for excellence in dispensing pharmacy.—The Merck award for excellence in pharmaceutical chemistry, and the Muldoon prize, an A. Ph. A. membership, for excellence in the department of chemistry, were won by Joseph Berger.—The Duquesne University Pharmaceutical Association prize for the best paper presented before the group was awarded to Peter Ollio.—The officers of the student branch of the A. Ph. A. for the coming year are: Peter Ollio, president; Joseph Schaberl, vice-president; Joan Atkinson, secretary-treasurer; Emilio Marano, athletic manager; and Sr. Barbara Marie Reusing, editor of *The Duquesne Pharmacist.*

University of Florida, School of Pharmacy.—Thomas J. Haley was granted the Doctor's degree in May. His dissertation was on the chemistry and pharmacology of two hydroxymercuribenzoates. Dr. Haley and John L. Voight were elected to Phi Sigma.—James D. Hendrix has been initiated a member of Rho Chi.

Fordham University, College of Pharmacy.—Eight students were graduated at the April commencement. Sister Mary Louise Landry, cum laude graduate, received the Bronx County Pharmaceutical Association's medal, the Jacob Diner medal, and the Merck award. Others honored for excellence in scholarship were Sister Mary Camilla Bestulli, Philip Egerman and Harold Fishkin.

George Washington University, School of Pharmacy.—Mrs. Jack Tingle has resigned and her work is being carried on by Mrs. Marjorie Bliven.—Dr. Gene Gramling, who is on war leave, recently received a field commission and is now in Germany.—Sister M. Renée Roache has been awarded the James D. Goddard prize as the senior having made the highest average in pharmacy.—Lt. Charles Bliven is now on duty at the Bureau of Medicine and Surgery in the Navy Department at Washington, D. C.

University of Illinois, College of Pharmacy.—Mr. Lawrence Templeton, associate in pharmacy, has resigned, having become the proprietor of a

pharmacy in Evanston, Illinois.—Dr. Edward P. Claus has been appointed assistant professor of botany and pharmacoynosy. Dr. Claus, who was originally at Pittsburgh College of Pharmacy, has been teaching the past year in the college of pharmacy of the University of Puerto Rico.

The State University of Iowa, College of Pharmacy.—The following prizes were awarded for work done during the 1944-45 academic year,—American Foundation for Pharmaceutical Education scholarships, Beverly Carlson and Anne Peterson; Ford Hopkins scholarship to the most deserving student who has completed the first year in course with a minimum grade average of 2.75, Claire Rankin; Rho Chi prize to the first year student attaining the highest scholastic average for the year's work, Claire Rankin; Chehak prize to the senior attaining the highest rank in biochemistry, Mary Jane Vande Voort; Scherling prize for excellency in organic chemistry, Helen H. Turnbull; Lehn and Fink Gold Medal to the senior student attaining the highest scholastic average in all pharmaceutical subjects, Elder G. Hoines; Merck prize to the second year student attaining the highest rank in pharmaceutical laboratory work, Charles Schillig; Kuever prize to student attaining the highest rank in first year pharmaceutical laboratory, Claire Rankin; Teeters prize to the student attaining the highest rating in pharmacognosy, Elder G. Hoines; Zopf prize to the student attaining the highest rank in practical pharmacy, John Paul Street.

University of Kansas, School of Pharmacy.—Kappa Epsilon and Kappa Psi sponsored the annual senior banquet on June 9 at which Dean Reese honored each graduate individually. The after dinner speaker was Dr. Roy Q. Brewster of the department of chemistry.—Cecil Hudson was given the Merck award in dispensing pharmacy and Carl Robson won the Lehn and Fink medal and the Kappa Psi scholarship key.—Dean Reese and Dr. Havenhill attended the Midwest Conference of Pharmaceutical Association on June 10.—The students and faculty enjoyed the presentation of the "Bill Procter" film.—A number of junior students prepared papers on appropriate subjects and presented them before the class on "The Pharmacy of Organic Medicinal Products."

University of Maryland, School of Pharmacy.—Dr. Donald E. Shay is the new associate professor of bacteriology. He succeeds Dr. Thomas C. Grubb who resigned to accept a position with the Vick Chemical Co. of Flushing, Long Island. Dr. Shay received the B. S. degree from the Lebanon Valley College, and the M. S. and Ph. D. degrees from the University of Maryland.—Mr. Albert Mattocks, who has been assistant in analytical chemistry, received the Ph. D. degree from the graduate school on March 26, 1945, and accepted a position as a research pharmacist with the Southern Research Institute of Birmingham, Alabama.—Miss Bernice Heyman, who was an assistant in economics and a graduate student in the school of pharmacy of the University of Maryland, has resigned to accept a position as research librarian with General Foods, Inc., Hoboken, New Jersey.—Dr. George P. Hager, Jr., who held the Wm. R. Warner fellowship in pharmaceutical chemistry in the school of pharmacy and received the Ph. D. degree in 1942, has returned as assistant professor of inorganic and organic chemistry. After graduation Dr. Hager was associated with Eli Lilly & Company as a research chem-

ist.—On December 22, 1944, ten graduates received the Bachelor of Science in Pharmacy degree. Milton A. Klepfish received the gold medal for general excellence and was also awarded the William Simon Memorial prize for proficiency in practical and analytical chemistry.—LeRoy Curtis Keagle received the Ph. D. degree from the graduate school, and is now at the school of pharmacy, Purdue University, engaged in research work.—The so-called accelerated program of instruction instituted as a war measure was discontinued at the end of the spring quarter in 1945, and the regular program of instruction, scheduled on the semester basis, will begin with the opening of the Fall Session on September 24.

Massachusetts College of Pharmacy.—Dr. Leon A. Thompson, chairman of the department of pharmacy, had retired after thirty-six years of service. He will continue on the Board of Trustees. Dr. Thompson presented a $1000 war bond to the college to establish a fund (The Leon A. Thompson Fund), the income from it is to be used for general college purposes. In recognition of Dr. Thompson's service and as a tribute of the love and esteem in which he is held, the alumni presented him with a cabin cruiser and a check for $1800 for operation expense. He plans to use the cruiser at his home on the Maine coast where he will spend much of his time. Accompanying the gift were two volumes containing letters from more than six hundred of his friends.—Prof. Leslie M. Ohmart has been appointed chairman of the department of pharmacy to succeed Dr. Thompson.—At the annual refresher course held in May, Dr. Edwin J. Cohn, biochemist at the Harvard Medical School, spoke on "Blood Derivatives, Their Natural Functions and Their Clinical Uses" and Dr. Justin L. Powers, chairman of the Revision Committee of the National Formulary, spoke on "The National Formulary VIII."—The commencement address on June 20, was delivered by Governor Maurice J. Tobin of Massachusetts.

University of Minnesota, College of Pharmacy.—Six students received the bachelor of science degree at the June 16 commencement. The master's degree was conferred upon Akiro Asano.—Dr. T. O. Soine was advanced to an assistant professorship.—Prof. Walter Fredell of Drake University is doing graduate work in residence this summer. On August 1, he joins the research staff of the Lambert Pharmaceutical Company of St. Louis.—Ensign Reid Micklesen, a former graduate student, is teaching Russian at Annapolis Naval Academy.—Akiro Asano, Hazel Landeen, Robert Muller and Lawrence Small have been elected to Rho Chi and Doris Shelly of Minneapolis and Gail Bay of Tarkio, Missouri, have been appointed graduate teaching assistants for 1945-46.—The faculty took an active part in the program of District No. 5, which was held on May 7-8 in Minneapolis.—The State Board of Pharmacy held its examinations for licensure in Wulling Hall on July 23-24.—The following awards for 1945-46 have been made for excellence in scholarships,—Minnesota State Pharmaceutical Association Graduate fellowship, Robert H. Miller; Samuel W. Melendy Memorial graduate fellowships, Akiro Asano, Robert E. King and Hazel E. Landeen; Lederle fellowship in pharmaceutical chemistry, Robert F. Doerge; Samuel W. Melendy Memorial scholarships,—Sabura Aisawa, Robert Bardwell, Phyllis R. Hanson, Arthur Mortenson, Albert Musich, Jeanne Stageberg, Roman J. Zweber; Lehn and Fink medal, Egen Felosi; Wulling Club key, William Trumm;

Rho Chi Sophomore prize, Jeanne Stageberg; Kappa Epsilon award, Margaret Heinz.

University of Montana, School of Pharmacy.—The Montana state board of pharmacy has prepared a bulletin upon the opportunities of pharmacy for high school graduates and illustrated it with pictures of students doing work in the laboratories of the school of pharmacy.—Dr. Curtis H. Waldon resigned from the faculty of Purdue University to take the position vacated by Dr. J. C. Kopet last June. He will succeed Dean C. E. Mollett as administrator of the school of pharmacy. Dean Mollett retires in accordance with the administrative policy at the University because of retirement age for administrative duties. He will continue on the pharmacy staff.—Two students in the school of pharmacy have maintained exceptionally high scholarship standards and will graduate with honors. Dana LeValley received the Lehn and Fink medal and Kathleen Hubbard, the Merck award.—Dorothy Stricklin has been elected vice-president of Phi Sigma, national biological society.—Substantial additions have been made to the pharmacy library and a considerable amount of laboratory apparatus has been acquired during the year.

University of Nebraska, College of Pharmacy.—Dr. Donald M. Pace, associate professor of physiology, was recently elected member of the Society for Experimental Biology and Medicine.—The Ella Sachs Plotz Foundation for the Advancement of Scientific Investigation has granted $300 to Dr. Harald Holck, associate professor of pharmacology, for furthering research in the relation of sex to drug action.

University of Oklahoma, School of Pharmacy.—Six students received degrees at the May commencement.—Six graduates passed the board examinations in May and six pharmacy students are registered in the summer session.—Jean Brown and Margaret Hildebrandt have been initiated into Rho Chi.—A considerable number of new books have been added to the library and a supply of actinic-ray proof glassware has been acquired for the use of the graduate students.

Oregon State College, School of Pharmacy.—Six seniors completed requirements for graduation and were awarded their degrees on June 10.—Kathren L. Gannon was the recipient of the Merck award of pharmaceutical books and a year's membership in the American Pharmaceutical Association given by the North Pacific Branch of the A. Ph. A.—Orpha G. Lee was winner of the Lehn and Fink medal and a $15 award from the Women's Auxiliary of the Oregon State Pharmaceutical Association.—Virginia G. Downing, freshman, was awarded the $25 scholarship prize awarded by the Auxiliary.—Professor Frank R. Henry left June 25 for Purdue University, where he will do graduate work in pharmaceutical chemistry.—Eight candidates took the Oregon state board of pharmacy examinations held at the college June 5-6.—Dean George E. Crossen has been named director of the analytical laboratory of the state board of pharmacy.—The Portland alumni chapter of Lambda Kappa Sigma awarded a scholarship key to Mrs. Betty Cayo Crisp.—One of the laboratories in the pharmacy building is being completely remodeled and will be used for the course in prescription compounding.

Philadelphia College of Pharmacy and Science.—The following scholarships have been recently awarded to upper classmen: to senior students, Henning O. Juncher, Dorothy Lesitsky, Henry Stemoen; to juniors, Dorothy Zimmer, Audrey B. Westfall, Ida May Ritter, Stanley M. Davis; to sophomores, Richard Leff, Doris Finkelstein, Cecelia McCormick and Pearl G. Roberts.—Announcement is also made of the availability of five fully paid freshman scholarships for students entering September 20, four will be for students majoring in pharmacy and one majoring in chemistry, bacteriology, or biology. The American Foundation for Pharmaceutical Education will aid in the support of those majoring in pharmacy.—The accelerated program was abandoned in July and there will be a student vacation period until the opening of school in September. The commencement program was held on July 24, and the annual homecoming celebration took place on June 5. Assistant Dean Tice is president of the Alumni Association this year.—The College cooperated with the Philadelphia Association of Retail Druggists and Temple University, School of Pharmacy in a graduate Seminar consisting of lectures on six successive Thursday evenings. The attendance was exceptional. A three-day seminar (the fifth of its kind) on Modern Pharmaceutical Practice was held on May 7, 8, 9. Plans are also being made for a post-war seminar for returning service men.—A modern sound film projector has been purchased which will enhance the teaching program and allow for use the many fine motion pictures with sound now available.—The service flag now bears eight gold stars and indicates also, there are 456 graduates are in service and 165 students are wearing the uniform of the armed forces.—Recently the local organization, Beta Sigma Omega, became the Omicron Chapter of Kappa Epsilon. Eleanor Brown is president.—The Eta Chapter of Lambda Kappa Sigma recently observed the 25th anniversary of the establishment of this chapter at this college.—At a recent election by the Philadelphia Branch of the American Pharmaceutical Association, Madeline O. Holland, librarian, was elected second vice-president and John E. Kramer, registrar, was named secretary-treasurer of that group.—Plans have been announced for providing graduates and others now in the service, with refresher courses to equip them better to re-enter their profession. The training will necessarily vary depending upon the time that has expired since the date of graduation and whether their training and duties in the armed service were closely allied to the profession for which they were trained in college.

University of Pittsburgh, School of Pharmacy.—Twelve students were graduated at the June commencement, Natalie M. Certo with high and Fern A. Heidt with highest honors. Miss Heidt was awarded the J. H. Beal, the Faculty scholarship prizes and the Lehn and Fink medal. Miss Certo won the Mendelson and Canter prizes.

Purdue University, School of Pharmacy.—Governor Ralph F. Gates has appointed Dean Glenn L. Jenkins to membership on the Indiana State Board of Health for a three year term. The last general assembly passed an act recognizing the Board of Health and providing for a new board of nine members to be made up of three physicians, one dentist, one pharmacist, one nurse, one veterinarian, one sanitary engineer, and one layman. The law provides that the new board shall be the policy-making

and regulatory body in matters pertaining to public health. It also provides that the board shall plan for research and investigation and dissemination of knowledge concerning health problems. The new board met for the purpose of organization in the governor's office in Indianapolis on May 10.—Dean Jenkins addressed the Elkhart Rotary Club at Elkhart recently on "Drugs and Health."—Prof. H. G. DeKay has completed the course for X-ray technicians given by the Technical Service Division of the General Electric X-ray Corporation. He will present a course in X-ray Technic in the July term.—Prof. L. D. Edwards and Miss M. Jeanne Noonan addressed the research staff of Irwin, Neisler & Company on May 7, at Decatur, Illinois.—Dr. C. O. Lee recently attended the meeting of Sub-committee #13 of the U.S.P. Revision Committee which was held in Philadelphia.—Herschel Cox, who will receive the M. S. degree in June, has accepted a position in the laboratory of World's Products Company.

Medical College of the State of South Carolina, School of Pharmacy.—John J. Voigt, M. Sc., Purdue '29, has been appointed associate professor of pharmacy.

Western Reserve University, School of Pharmacy.—A student branch of the American Pharmaceutical Association is in the process of organization.

A Memorial

WILL BROOKLEY

On June 11, Will Brookley, a pioneer Nebraska druggist died. Mr. Brookley practiced his profession at Edgar, Nebraska, for four decades. During this period he served his county as treasurer for a period of four years and was a member of the Nebraska Senate from 1913 to 1915. It was during this term of service that he sponsored a bill which created the College of Pharmacy at the University of Nebraska. His son, Wendell, was a student of that school in the early days. During the First World War Wendell enlisted in the air force at a Texas field and became one of the most skillful and famous pilots of his day. A few years ago he was killed in an air crash at Washington while serving in the line of duty. He was buried on the side of the hill in Arlington just below the tomb of the Unknown Soldier. Brookley Field at Mobile, Alabama, was named in his memory. Will Brookley professed no claim to greatness. He was one of those common garden variety of druggists who said little but did much. He held every honor in his state that his profession could bestow upon him, and he served that profession well. Pharmaceutical education and practice owes much to the unsung heroes of his type. Such men are not only the backbone of the profession, they constitute its very foundation.

Rufus A. Lyman

Miscellaneous Items of Interest

Ernest Little, Doctor of Laws*

President Johnson, Dr. Ernest Little is Dean of the College of Pharmacy of Rutgers University.

Dr. Little earned his Bachelor of Science and Master of Science degrees at the University of Rochester. He went to Columbia University for his Master of Arts and Doctor of Philosophy degrees. He then attended the University of Graz in Austria and studied micro-chemical analysis under the celebrated Dr. Hans Lieb He holds the honorary degree Doctor of Science from the Philadelphia College of Pharmacy and Science.

Dr. Little has taught chemistry in the University of Rochester, Pratt Institute, Adelphi College, Columbia University and Rutgers University.

He has given freely of his time and talents to national associations, particularly the American Pharmaceutical Association, the American Association of Colleges of Pharmacy and the American Chemical Society.

Dr. Little has been President of the American Association of Colleges of Pharmacy; for five years he was chairman of the Executive Committee of that Association. He is a member of the American Council on Pharmaceutical Education, the accrediting agency for schools and colleges of pharmacy. He is a member of the Council, the governing body of the American Pharmaceutical Association. He is a member of the Board of Trustees of the United States Pharmacopœia.

For many years Dean Little headed the small group which kept alive the idea of a foundation for the financial support of pharmaceutical education; when it was organized and incorporated in 1942, he became the first president of the American Foundation for Pharmaceutical Education. He is a member of its Board of Directors and a member of the Executive Committee of the Board. May I state in passing that while the Foundation has been a corporate body for only two years, its donations are rapidly approaching the million dollar mark. The initial goal is five million dollars.

Dean Little has made noteworthy contributions to professional education through his work on the Foundation. He has been a leader in pharmaceutical education for more than two decades. His usefulness in his profession and to society in general is indicated by the positions of leadership, trust and honor to which he has been called, some of which I have mentioned.

Mr. President, I have particular pleasure in presenting to you Ernest Little for the honorary degree Doctor of Laws.

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*This citation was read by Dean H. Evert Kendig on the occasion of the conferring of the honorary degree by President Robert L. Johnson of Temple University on June 29, 1945.

The Third Annual Meeting of the American Institute of the History of Pharmacy, Inc.

For reasons beyond the control of the officers of the Institute, the Third Annual Meeting, according to the Articles of Organization to be held on the first Thursday in April, had to be postponed for five days and was held on Wednesday, April 11, 1945.

The president, Dr. Arthur H. Uhl, in opening the meeting, welcomed especially Dean H. O. Holt, director, Department of Public Service of the University of Wisconsin, Mr. Ed. Berg, who had come from Chicago to attend the meeting, and Mr. Oscar Rennebohm, lieutenant governor of the state of Wisconsin. As to the Institute's business in 1944, Dr. Uhl referred to the report on the meetings held at Cleveland, a copy of which had been sent to every member of the Institute and copies were distributed to those present.

After a brief report by the treasurer, a copy of which is attached, the president proceeded to the election of the Board of Directors (officers and council members) pointing out the fact that in 1944 two changes had been made by unanimous vote of the Board of Directors: the filling of the office of the third vice-president by Mr. A. J. Horlick, Racine, taking the place of the late Dr. J. Leon Lascoff, and the replacement of one of the council members by Dr. Forest J. Goodrich, dean of the college of pharmacy of the University of Washington. The entire board and officers were reelected for another two-year term.

The election was followed by a detailed report of the president on plans of securing the maintenance of the American Institute of the History of Pharmacy and of giving it academic standing by a connection with the University of Wisconsin through a professorship of the history of pharmacy to be held by the Director of the Institute. Dr. Uhl explained how this personal union would benefit the American Institute of the History of Pharmacy as well as the University of Wisconsin and finally American pharmacy. It would assure the continuous utilization and cultivation of the unique pharmaceutico-historical treasures at the University of Wisconsin acquired during a period of more than fifty years due to the indefatigable zeal of the late Dr. Edward Kremers. It would offer to pharmacy a unique educational opportunity whereby graduate study in all phases of pharmaceutical sociology could be undertaken with the prospect of acquiring higher academic degrees by those interested in and intending to use this special knowledge in the administrative, journalistic or advertising field. Finally this connection of a pharmaceutical cultural institution grown up from the profession as such and remaining a part of it with one of the great American universities would make pharmacy in the United States still more the counterpart of medicine which is pursuing the cultivation of its cultural aspects in quite a similar set-up, i. e. a personal union between an Institute of the History of Medicine and a correlated professorship, at Johns Hopkins University.

Mr. A. J. Horlick, the new third vice-president of the American Institute of the History of Pharmacy, is taking a personal interest in this

plan the realization of which, like the establishment of the medico-historical set-up at Johns Hopkins, depends on an adequate endowment.

The report was received with much interest and the active interest of Mr. Horlick found full appreciation. The hope was expressed that other men in pharmaceutical industry may follow the lead of Mr. Horlick.

Mr. Rennebohm asked whether there is any prospect of a more active support of the work of the Institute after the change in the secretaryship of the A.Ph.A. The Director of the Institute replied that the personal relations with the men at the helm of the A.Ph.A. are excellent and that there is all reason to believe in a fruitful cooperation.

Mr. Berg advocated a more aggressive propaganda for the Institute. He reported his own experiences in attempts at inducing practicing pharmacists to join the Institute proving that there still was much work to be done in order to make the bulk of the profession see the educational and representative value of the pharmaceutico-historical movement. He suggested the appointment of district representatives whose task it would be to approach the practitioners and which were to be furnished with material for talks and distribution. Mr. Berg voiced furthermore the opinion that our main hope rests on the younger generation and that the members of the state boards should be asked to recommend to the candidates for licensure membership in the A.I.H.P.

A vivid discussion in which Mr. Dretzka, Dr. Chechik, Mr. Hayden, Dr. Uhl and Dr. Urdang participated, was concluded by Dr. Uhl by extending his thanks to Mr. Berg for his very interesting remarks and suggestions.

The meeting was adjourned until the time of the American Pharmaceutical Association meeting, 1945, should such a meeting be held.

Those present were: *Members*, Ed. Berg, S. R. Chechik, S. H. Dretzka, E. A. Hayden, J. P. Lee, Jennings Murphy, O. Rennebohm, J. C. H. Russell, Edith C. Schmitz, E. S. Schweger, G. H. Svoboda, A. H. Uhl, G. Urdang; *Guests*, E. R. Bonow, H. O. Holt.

Jennings Murphy, Secretary.

The American Institute of the History of Pharmacy, Inc.

Financial Statement for fiscal period beginning July 1, 1944, and ending December 31, 1944.

Receipts

Cash in bank—July 1, 1944		$4,796.73
Receipts—Memberships—Individual	$ 260.00	
—Constituent	50.00	
—Supporting	200.00	
Dr. George Urdang from honorariums	120.00	
Sale of Scheele Brochures, etc.	11.31	
Special contributions:		
Fritzsche Bros.	1,000.00	
Total receipts		1,641.31
Total		6,438.04

Disbursements		
Dr. Urdang, Director—Salary	1,200.00	
—Travel expense	123.60	
Printing, stationery and office supplies	17.35	
Postage	50.00	
Brochures and reprints	97.38	
Photos and mountings	33.57	
Book premium	3.41	
Total disbursements	$1,525.31	
Cash in bank—December 31, 1944	4,912.73	
Total		$6,438.04
Cash in bank—March 31, 1945		$5,579.48

Sylvester H. Dretzka, Treasurer

Scientific and Educational Papers Published by the Faculties of the College of Pharmacy During the Calendar Year 1944 to Date*

Abreu, Benedict E.

Caudal Analgesia in Normal and Complicated Labor, P. P. Volpitto, R. A. Woodbury, B. Abreu and R. Torpin, Southern Med. J., Feb. (1944), J. M. A. Ga., *33*, 35-37 (1944).

Effects of Posterior Pituitary Extract, Oxytocin (Pitocin) and Ergonovine Hydracrylate (ergotrate) on Uterine, Arterial, Venous and Maternal Effective Placental Arterial Pressures in Pregnant Humans, R. A. Woodbury, W. F. Hamilton, B. Abreu, R. Torpin and P. H. Fried, J. Pharmacol. Exper. Therap., *80*, 256-263 (1944).

Cardiac and Blood Pressure Effects of Pitocin (Oxytocin) in Man, R. A. Woobury, W. F. Hamilton, P. P. Volpitto, B. Abreu and H. T. Harper, Jr., J. Pharmacol. Exper. Therap., *81*, 95-100 (1944).

Influence of Diethylstilbestrol Upon the Effects of Small Doses of Vasopressin, D. F. Marsh, R. A. Woodbury and B. Abreu, Fed. Proc., *3*, 89 (1944).

Choline Esterase Activity of Normal and Pre-eclamptic Human Placentas, B. Abreu and R. A. Woodbury, Fed. Proc., *3*, 64 (1944).

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*In former years, papers appearing only in the year previous to that of publication has been included in this list. However, since it has been found to be impracticable to get these papers collected before the July number we have thought it best to include all titles to date (also those in press). There have been many worthwhile papers of a popular nature, prepared for public delivery, which is a commendable service, but the number is so large publication is an impossibility.—Editor.

Influence of Neostigmine on Arterial Pressure and Uterine Activity of Eclamptic Patients, R. A. Woodbury, B. Abreu, R. Torpin and P. H. Fried, Fed Proc., *3*, 87 (1944).

Cardiac and Blood Pressure Effects of Posterior Pituitary Preparations, R. A. Woodbury, W. F. Hamilton, P. P. Volpitto, B. Abreu and H. T. Harper, Jr., Program, Ga. Acad. Sci., Aug. (1944).

Anticholinesterase Activity of Estrogens, Oxytocin and Vasopressin, B. Abreu and R. A. Woodbury, Program, Ga. Acad. Sci., Aug. (1944).

Adsorption and Excretion of Diethylstilbestrol, D. F. Marsh, R. A. Woodbury and B. Abreu, Program, Ga. Acad. Sci., Aug., (1944).

Chronic and Delayed Toxic Effects of Certain Saturated and Unsaturated Halogenated Hydrocarbons in White Rats and White Mice, B. Abreu, S. H. Auerbach, J. M. Thuringer and S. A. Peoples, J. Pharmacol. Exper. Therap., *80*, 139-143 (1944).

Influence of Oxytocin (Pitocin) Upon the Heart and Blood Pressure of the Chicken, Rabbit, Cat, Dog and Turtle, R. A. Woodbury and B. Abreu, Amer. J. Physiol., *142*, 114-120 (1944).

Influence of Epinephrine Upon the Human Gravid Uterus, R. A. Woodbury and B. Abreu, Am. J. Obst. and Gyn., *48*, 706-708 (1944).

The Influence of Different Forms of Mechanical Artificial Respiration Upon the Pulmonary and Systematic Blood Pressure, P. P. Volpitto, R. A. Woodbury and B. Abreu, J. A. M. A., *126*, 1066-1099 (1944).

Influence of Neostigmine Methylsulfate on Pre-eclamptic Patients and Choline Esterase Activity of Placentas from Normal and Pre-eclamptic Patients, R. A. Woodbury, B. Abreu, R. Torpin and P. H. Fried, J. Am. M. A., (in press).

Influence of Dying Gasps, Yawns and Sighs on Blood Pressure and Blood Flow, R. A. Woodbury and B. Abreu, Am. J. Physiol., *142*, 721-726 (1944).

Pharmacological Effects of β-piperidinoethyl-α-Methyl p-xenylate HCl, β-diethylaminoethyl Phenyl-α-thienylacetate HCl and β-diethylaminoethyl Phenyl-α-thienylglycolate (Hydroxyacetate) HCl, B. Abreu and E. T. Elam, Fed. Proc., *4*, 110 (1945).

Anderson, Hamilton H.

Effect of 4, 4′ Diamidino Stilbene in Experimental Leishmaniasis, H. Y. Soong, S. C. Fu and H. H. Anderson, (in press).

Pharmacologically Active Biurets Containing Piperidine and Their Related Compounds, C. H. Ch'eng, P. P. T. Sah and H. H. Anderson, (in press).

Comparative Effectiveness of 4, 4′ Diamidine Stilbene and Other Agents in Experimental Leishmaniasis, H. H. Anderson and H. Y. Soong, Fed. Proc., *3*, 64 March (1944).

Immunity Reactions in Experimental Relapsing Fever, Y. P. Chen, S. H. Zia and H. H. Anderson, Amer. J. Trop. Med., *25*, 115 March (1945).

Comparative Amebacidal Activity of Phenyl Arsine Oxide (Mapharsen), Related Arsenicals and Other Agents, H. H.

Anderson and Thomas T. K. Chuan, Amer. J. Trop. Med., *24*, 367 Nov. (1944).
Experimental Methods for the Evaluation of Antiparasitic Agents, H. H. Anderson, Chem. and Eng. News, Amer. Chem. Soc., *22*, 1365 Aug. 25 (1944).
Chemotherapy of Parasitic Diseases, H. H. Anderson, Bull. Calif. Sec. Amer. Chem. Soc., The Vortex, *6*, 70 Feb. (1945).

Daniels, Troy C.
Basic Sciences in the Pharmacy Curriculum, T. C. Daniels, Amer. J. Pharmaceutical Education, July, (1944).
Chlorellin, an Antibacterial Substance from Chlorella, T. C. Daniels with collaborators, Science, *99*, 351-352, No. 2574 April 28 (194).

Eiler, John J.
The Effect of Thyroxin on the Maximum Rate of Transfer of Glucose and Diodrast by the Renal Tubules, John J. Eiler, T. L. Althausen and M. Stockholm, Am. J. Physiol., *140*, 699 (1944).
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Chlorellin, and Antibacterial Substance from Chlorella, J. J. Eiler with others, Science, *99*, 351 (1944).
Suppositories, John J. Eiler, American Pharmacy, Chap. 11, J. B. Lippincott Co., 1944 (in press).
Self Emulsifying Suppositories Containing Cocoa Butter, P. Waxman and John J. Eiler, J. Am. Pharm. Assoc. Practical Edition (in press).

Kumler, Warren D.
Chlorellin, an Antibacterial Substance from Chlorella, W. D. Kumler with others, Science, *99*, 351-2 (1944).
A Simple Adaptation of the Ultraviolet Photographic Spectrophotometer to Direct Visual Measurement, L. A. Strait, W. D. Kumler and Frank M. Goyan, Bull. of Amer. Phys. Soc., *19*, No. 4, 6 (1944).
Dipole Moments of Some Sex Hormones, Sterols and Isophorone, W. D. Kumler and George M. Fohlen, J. Amer. Chem. Soc., *67*, 437-41 (1945).

Marshall, Max S.
Anaerobic Plates, M. S. Marshall and H. P. Nordby, J. Bact., (in press).

Oneto, John F.
Chlorellin, an Antibacterial Substance from Chlorella, R. Pratt, J. F. Oneto et al., Science, *99*, 351-2 (1944).

Pratt, Robertson
Influence of Light on the Infection of Wheat by the Powdery Mildew Erysiphe graminis tritici, R. Pratt, Bull. Torrey Bot. Club, *71*, 134-143 (1944).
The Hottentot Fig (Mesembryanthemum eduli) as a Possible Commercial Source of Tannin, R. Pratt and Thomas Hum, Pl. Physiol., *19*, 384-386 (1944).

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Studies on Chlorella vulgaris. IX. Influence on Growth of Chlorella of Continuous Removal of Chlorellin from the Culture Solution, R. Pratt, Amer. J. Bot., *31*, 418-421 (1944).

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Studies on Chlorella vulgaris. X. Influence of the Age of the Culture on the Accumulation of Chlorellin, R. Pratt, John F. Oneto and Jane Pratt, Amer. J. Bot., *32*, (in press) (1945).

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Strait, Louis A.

Protective Barriers of the Central Nervous System, R. B. Aird and L. A. Strait, Archives of Neurology and Psychiatry, *51*, 54-66 (1944).

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British Pharmaceutical Students Association

The British Pharmaceutical Students Association held its third annual conference at 17, Bloomsbury Square, London, W. C. 1. in April last. There was a record attendance which included delegates from most of the schools of pharmacy of the universities and colleges in Great Britain. Mr. J. E. Shinner, Ph. C., presided.

Prof. W. H. Linnell, first professor of pharmaceutical chemistry in the University of London, delivered a lecture on "Chemotherapy and the Pharmacist." He began by comparing the position in the dye industry in England before and after the last war, with that of chemotherapy today. The prohibition of imports imposed in the last war had enabled them, he said, to develop the manufacture of dye stuffs and a similar situation existed today with regard to chemotherapeutic agents. Research in chemotherapy was essentially a collaboration between the chemist, physiologist, pharmacologist, bacteriologist and pharmacist; individual workers did not possess sufficient knowledge of all the branches to adequately direct the research. Pharmacists by virtue of their wide basic training were specially suited after further study for work in the field. They should develop a research organization in which the different workers had ready access to one another. Professor Linnell emphasized the immense benefits to humanity resulting from the evolution of new synthetic compounds based on a study of the chemical structure of well known drugs.

Prof. H. Berry, dean of the College of the Pharmaceutical Society of Great Britain, addressed the conference on "Pharmacy within the University." Prof. Berry outlined the history of pharmacy from about the year 1800, giving the picture of its development, and the way in which it had broadened and become diversified in its character with successive editions of the British Pharmacopœia. The most recent editions bit deeply into retail practice for while most of the manufacture of galenicals had already gone some dispensing was now lost and the most modern type, that of the preparation of sterile injections, presented problems which were not easily solved. When manufacturing processes left the shop they had not left pharmacy—they had passed to the laboratories of manufacturing houses, to hospitals, to research laboratories, and generally speaking, pharmacists had followed them there, though some sections had become specialized and linked with medicine. If modern pharmacy were to be understood and practiced, whether in the retail or the wholesale, then, said Prof. Berry, a knowledge of the fundamental sciences of biology, physiology, pharmacology and bacteriology must be obtained and applied. These subjects were recognized by the universities and taught therein, and there was every reason why training in their application in pharmacy should also be within a university.

Prof. Berry then dealt with the respective merits of pharmaceutical degrees and diplomas (In Great Britain the Pharmaceutical Society grants its own diplomas) emphasizing that the university provided every facility for the degree student to advance his knowledge and his status after graduation, and to mark and label these advances by post graduate research degrees. A diploma was usually granted by a non-university body which was concerned with a special practice. It was generally speaking, slow to change and crabbing in advancement. All degrees were not perfect in their conception or design and Prof. Berry considered an internal degree to be a better system than an external one as the examination for the former one was always based upon the course which the student had received. It followed that the course of instruction could be altered from session to session so as to keep pace with developments in that science. This could not be done very easily with an external degree —it was impossible with a diploma.

Discussion. The following points were raised by delegates.

At the moment courses were too crammed to produce the student who was capable of doing research. The pharmacy syllabus needed to be pruned with respect to much old fashioned pharmacy such as plasters, blisters, pills, etc. Would the introduction of therapeutics into the curriculum be opposed? What were they going to do with pharmacognosy? Should they associate with the medical schools in the universities? Would they go on talking chemotherapy and selling coloured water? Should they revise the syllabus before ex-servicemen were rehabilitated? Was additional education compatible with present day salaries?

In his reply Prof. Berry agreed that the degree course was too crammed and another year was required—this was under consideration. The pharmacy syllabus would be revised and would contain more modern pharmacy. The introduction of pharmacology into the curriculum had been favourably received by the medical faculty, pharmacists also needed

a knowledge of therapeutics. Pharmacy should be within the faculty of medicine of the university, but the two schools should be separate. A state medical service would encourage pure pharmacy, but what qualification would the state want? Adequate provision would be made for ex-servicemen, but they should exercise care in whom they admitted to pharmacy. The trouble with retail pharmacy was that there were too many pharmacists for the amount of purely pharmaceutical work to be done and consequently it was diluted.

The Pharmaceutical Society of Great Britain was alone in being an examining and registering body; it might ultimately cease to be an examining body. British pharmacists need, however, have no inferiority complex, their standard of pharmaceutical education was higher than anywhere on the continent.

At the third session the following resolutions were passed:

1. That with the prospect of some form of compulsory military training being adopted, the Pharmaceutical Society's Council decision that the intermediate examinations be taken prior to apprenticeship be implemented immediately.

2. That the Pharmaceutical Society's intermediate examination be abolished not later than July 1948 in favour of the University intermediate examination in the appropriate subjects.

3. That students should be allowed to consult their practical note books in the biochemistry section of practical physiology.

The fourth session was addressed by the President of the Pharmaceutical Society of Great Britain (Mr. E. G. Wells), Miss M. C. Islip, president of the National Association of Women Pharmacists in Britain, and Mr. C. W. Maplethorpe, Ph.C. F.R.I.C., on the "Prospects on Qualifying."

Mr. Wells, dealing with the future of retail pharmacy in the proposed National Health Service, said that while there would undoubtedly be more insurance dispensing, many people would still prefer private treatment, and in many cases continue to pay for their medicines. He did not object to health centers but they should be kept for the purpose for which they were intended, viz., providing doctors with extra facilities, and apparatus for diagnosis and treatment. They must be prepared to give a service to the public possibly until 7 p. m. or even later for urgent medicines.

Miss Islip said that although most women pharmacists were employed in retail or hospital work,there were openings for them in many fields. As regards private retail pharmacy, there was more scope and opportunity for expressing individuality than in other sections of the profession. Hospital pharmacy involved shorter hours but more exacting work. She hoped that in new Health Services all hospitals would gain some of the freedom that was enjoyed by the voluntary hospital.

Mr. Maplethorpe said that there were places for pharmacists of all grades in industry and there was a variety of positions available, e. g.,

analytical, bacteriological research, production, administrative. The person with a pharmaceutical training and an additional qualification was of course of more value than a science graduate with experience only of the university laboratory. Those who intended to work on the production of galenicals and fine chemicals should make up their minds to study chemical engineering. If the highly qualified pharmacist had aspirations towards administrative work he must study labour management and have a knowledge of the Factories Act and its requirements as applied to his industry.

At the business session of the conference students rejected the Joint Industrial Council's scale of salaries for retail pharmacy and considered that no pharmacist should receive less than £7. 7. 0. a week on qualifying.

Mr. A. E. Meadowcroft, Ph.C., was elected president with the following committee:

W. Burke (College of the Pharmaceutical Society), secretary;
C. R. Dimond (Cardiff, Wales);
Miss J. Forrest (Leeds University);
W. Hennigan (Edinburgh, Scotland).

New Books

Black Widow, America's Most Poisonous Spider, by Raymond W. Thorp and Weldon D. Woodson. 1945. University of North Carolina Press, Chapel Hill. Price $3.00.

The fact that the genus *Latrodectus* of the spider family, is found in each of the five continents in an alarmingly increasing number, with comparative symptoms, sensations, great suffering, and even death, resulting from the bite, it is timely that this book should appear. It treats specifically with the black widow spider of the United States— *L. mactans*, one of the members of the genus and the only dangerous species in this country.

In the year 1934, a mild winter and a nation-wide drought resulted in a rapid increase of this venomous species, and newspaper headlines brought attention to human victims of spider bites, from Massachusetts to Idaho and the southwest. The public became black widow conscious.

The authors of this volume, following their individual fields of writing, became acquainted through study of the black widow spider and in 1934 began a 10-year period of intensive investigation. The result of this research was the publication of this book, the first complete one on the subject. Some material had been published and the authors correlated such information with that gathered from studying more than a thousand case histories and the medical knowledge regarding black widow spider bite and its treatment.

Legendary beliefs have been maintained from biblical times and much that is traditional is still believed implicitly today, as indicated by the spider folklore of the southern Negro. Exact scientific examination has separated the factual from the imaginative lore and it is primarily the purpose of this work to eliminate the hitherto accepted beliefs and practices from the proven findings of scientific research.

History and literature cite instances where influences, both evil and beneficial, are attributed to the spider in general; superstition is rife as is shown in the use of charms, incantations, and omens; on the other hand there are references to its use as a medical aid, such as the application of webs, suggested as fantastic cures.

An early chapter is devoted to a detailed report on various species of poisonous spiders and accounts of the poison potentialities of each. In narrowing their investigation to the black widow spider, the authors began probing the verity of numerous articles and found that imagination was the foundation of a great number, and there followed analytical studies on the reliability of such reports as found in the literature of the world. In the words of the authors: "judicial appraisal was used to discriminate between truth and fiction."

Spurred by insatiable scientific curiosity, the authors came to their findings and conclusions by observations made both in the field and the laboratory. The first recorded bite was in 1726 in Massachusetts, followed by an instance in 1801 in Rhode Island. Not necessarily indicated as bites of the black widow spider, these recordings led the authors through an investigation of the accounts and references to arachnidism in cumulative medical reports to the contemporary clinical manner of study of recognition and diagnosis.

The potential toxic qualities of the spider's venom were determined by experiments conducted upon various animals, revealing that in most cases severe symptoms developed and death often followed. Other experimental work involved the use of the venom on the experimenters themselves in various procedures, with unpleasant to dangerous results which, in most cases, would have become more serious if medical treatment had not been immediately available to the patient.

From a comprehensive conclusion obtained from these biological studies, the authors are able to give a detailed report on diagnosis and therapeutic treatment. Two definite conclusions arrived at in refutation of fallacies are that the venom of the male black widow spider is incapable of causing injury to a human being and that, contrary to popular belief, the female eats the male only when in direst hunger. The chronicling of the case histories in the clinic and laboratory has established the symptomatic picture of the effects of the bite on man and aided in knowledge of serums and other forms of treatment. The ultimate conclusion has been reached that the spider's bite may cause intense suffering to man, and under certain conditions, death may result.

The book has several excellent habitat photographs which are not only interesting in themselves, but instructive as an aid toward identification. Also, considerable space is devoted to the classification, description, and study of the life habits of the spider, and a summarizing of unpublished medical reports.

The authors have succeeded in presenting this work to interest both the layman and the scientist and for those who wish to investigate further into the case histories and sources there is an extensive bibliography. The only criticism offered by the reviewer is that this bibliography could have been even more complete.

H. M. B.

Special Bulletin on Post War Training for the Scientific Professions*

The National Stake in the Imperative Resumption of Training for the Scientific Professions

This Special Bulletin has been prepared jointly by the American Council on Education and the Office of Scientific Personnel of the National Research Council and with the cooperation of professional associations in the fields of medicine, dentistry, pharmacy, engineering, chemistry, and physics, as well as many individuals concerned with manpower in these fields. It is hoped that this issue will have wide circulation and will be of assistance to those both in and out of government who are seeking a solution to this vital issue.

Introduction

War has increased the need of the nation for technical and professionally trained manpower; yet, at the same time, it has decreased and nearly stopped the flow of able-bodied men into these fields so essential to the national health, safety, and interest. War has, also, brought a tremendous increase of our dependence upon specialized knowledge and skill but has sharply curtailed the training of selected individuals for service in these fields.

As America looks to the reconversion period, the increasing demand and greater dependency upon scientific and technological developments will increase. If these demands are to be met, if America is to have essential security in terms of national health, if we are to meet successfully the competition of nations that have preserved their professional personnel, we must begin now to take such steps as may partially make up for the growing deficit caused by the reduced flow of men into these

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*Only the first page of this bulletin, dated May 28, 1945, dealing with the general problem and that part dealing with the training of pharmacists is reproduced in this issue. The Bulletin was prepared by Francis J. Brown, Consultant, American Council on Education and M. H. Trytten, Director, Office of Scientific Personnel, National Research Council. The Pharmacy Section was written by Robert P. Fischelis, Secretary of the American Pharmaceutical Association. In writing about the Bulletin Dr. Fischelis said, "Considering the number of professions that have been omitted from consideration in this joint statement from the National Research Council and the American Council on Education, I feel that we have done rather well in impressing them with our problems." Dr. Fischelis is to be commended and the profession to be congratulated for this excellent presentation.—Editor.

fields. Either by administrative action or by legislation, we must reverse the policy established over the past eighteen months.

Although it is impossible to fill in all of the details regarding the shortage of manpower in essential fields and the resultant need of continuing training for service in these fields, the seriousness of the present situation can be demonstrated through a statement of facts in the fields of both health and technology.

Pharmacy

Pharmacists function in hospitals, drug manufacturing, laboratories, wholesale drug houses, law enforcement agencies, research laboratories, colleges of pharmacy, and as owners or managers of licensed pharmacies and as professional employees in such establishments. State laws universally require that the compounding of prescriptions and the dispensing of drugs, medicines, and poisons shall be limited to registered (licensed) pharmacists, or to persons working under their immediate supervision. This necessitates the continuous presence of at least one licensed pharmacist in every pharmacy. The greater the number of prescriptions compounded and the larger the volume of transactions in dispensing drugs, medicines and poisons in a given establishment, the more pharmacists are required. About eighty-eight per cent of all pharmacists are engaged in supplying professional services to the public in the retail pharmacies of the United States.

The minimum number of pharmacists required to give even fairly adequate service to the public in the dispensing of drugs, medicines and poisons and the compounding of prescriptions through retail pharmacies is given in Table I.

TABLE I

Number of Pharmacies and Required Manpower

Type of Pharmacy	*No. of Such Pharmacists*	*Minimum Licensed Pharmacist Manpower Required*	*Average No. of Pharmacists per Pharmacy*
One-pharmacy towns	8,000	9,200	1.15
Small pharmacies	22,842	25,040	1.14
Larger pharmacies	21,258	27,635	1.30
	52,100	61,875	1.2

Actuarial calculations place the annual number of deaths and retirements for age and disability among pharmacists at approximately three per cent of the total in active practice at any given time. Based on this figure the required annual replacement for those engaged in retail pharmacy, alone, would be about 1,612. The total number of pharmacists licensed in 1944 was 1,142.

The situation is growing progressively worse because graduation from an approved four year course in pharmacy is the gateway to licensure in pharmacy, and the number of graduates has been declining

steadily. In 1930-31 there were 2,943 graduates. In 1940-41 the number was 1,650. Table II shows the loss which will occur unless there is an immediate change in the policy regarding deferment.

TABLE II

Total Student Enrollment (Four Classes) 1941-42 to 1944-45

Fall Term	*Student Enrollment*
1941-42	8,223
1942-43	6,935
1943-44	3,384
1944-45	3,511

In January, 1945, there were 3,349 students enrolled in all colleges of pharmacy in the United States. Of these, 1,760 were male students, including 747 classified as 4F; 280 war veterans and 290 under 18 years of age. The remainder, 1,599, were women.

The problem may be summarized by stating:

(1) The number of pharmacies available to supply pharmaceutical service is decreasing;
(2) Pharmaceutical services required per pharmacy are on the increase;
(3) The number of available pharmacists is declining;
(4) The male enrollment in colleges of pharmacy has decreased rapidly, and the female enrollment has not increased to the point of making up the deficiency, thus leaving supply and requirements unbalanced to the point of creating a serious shortage of manpower in an essential health service.

Unless arrangements are made to permit capable male students to complete their college training in pharmacy, there will be a serious shortage of qualified personnel to man the essential retail pharmacies, manufacturing laboratories and wholesale drug houses, hospital pharmacies, colleges of pharmacy, and Army, Navy, public health service and other governmental services requiring trained pharmacists, at a time when such personnel will be sorely needed. The result may well be a lowering of the present high standards of qualification for this essential health service. This would be fraught with serious consequences to the public health and welfare.

An editorial in the July 21 issue of the Washington Post calls attention to the value of penicillin in therapeutics and also that its careless distribution and indiscriminate use may have unfortunate results. The Post commends Congress for the wisdom of bringing its manufacture "under the surveillance of the Pure Food and Drug Administration—a surveillance actively sought by the American Pharmaceutical Association and other interested groups in the drug trade."

The Plant Science Seminar

At a recent meeting of the Council of the American Pharmaceutical Association, it was decided that no convention of the American Pharmaceutical Association would be held this year, but that the Council would arrange for an annual convention as soon as the war emergency and national welfare would permit.

Since the Plant Science Seminar is affiliated with the American Pharmaceutical Association and holds its annual meeting immediately preceding the A. Ph. A. convention, and in close proximity to the Convention City, it has been decided to postpone the 23rd Annual Plant Science Seminar until such time as the American Pharmaceutical Association holds its next annual convention.

The 23rd Annual Plant Science Seminar was scheduled to have met in Philadelphia the week of September 3, 1945. Dr. Marin S. Dunn, as local secretary, had already tentatively planned an exceptionally attractive program including two all-day field trips. The Seminar committees appointed at the Cleveland meeting were actively engaged on their reports and the committee on the "Symposium on the Cultivation of Vegetable Drugs," which was to have been part of the 23rd Seminar, had obtained promises from leaders in this field in California, Oregon, Washington, Michigan, New York, Pennsylvania and other parts of the country to appear on the program of this symposium.

The Executive Council regrets that this important meeting of the Plant Science Seminar must be postponed. In view, however, of the rulings of the Office of Defense Transportation and the action of the Council of the American Pharmaceutical Association, such postponement is the only proper procedure at this time.

The present officers and council members will continue in office until the next annual meeting.

Elmer H. Wirth, Secretary

The American Journal of Pharmaceutical Education:

I have taken notice of your very interesting publication, in the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, and as Dean of the FACULTAD DE FARMACIA DE HONDURAS, and as a graduate of the Philadelphia College of Pharmacy, I would greatly appreciate if you would be so kind as to send to this college your reviews. I am sending you by mail our Boletin de la Facultad de Farmacia in which you will find some information in regard to our work in the registration of patent medicines, opening of drug stores, licenses to sell medicines of all kinds, and the study of the profession by the pharmacy students, classes and laboratory work, etc.

Wishing to hear from you soon I am truly yours.

Guillermo E. Duron
Dean of the Pharmacy School and
Faculty of Pharmacy
Tegucigalpa D. C., Honduras, C. A.

April 24, 1945

(Those who can supply material, kindly take notice.—Editor.)

INSTITUTIONS HOLDING MEMBERSHIP IN THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

New Jersey

Rutgers University, The State University of New Jersey, New Jersey College of Pharmacy, Newark (1923)
Ernest Little, Dean

New York

University of Buffalo, School of Pharmacy, Buffalo. (1939)
A. B. Lemon, Dean
Columbia University, College of Pharmacy of the City of New York. (1939)
Charles W. Ballard, Dean
Fordham University, College of Pharmacy, New York. (1939)
Charles J. Deane, Acting Dean
Long Island University, Brooklyn College of Pharmacy, Brooklyn. (1939)
Hugo H. Schaefer, Dean

North Carolina

University of North Carolina, School of Pharmacy, Chapel Hill. (1917)
J. Grover Beard, Dean

North Dakota

North Dakota Agricultural College, School of Pharmacy, Fargo. (1922)
William F. Sudro, Dean

Ohio

Ohio Northern University, College of Pharmacy, Ada. (1925)
Rudolph H. Raabe, Dean
The Ohio State University, College of Pharmacy, Columbus. (1900)
Bernard V. Christensen, Dean
University of Toledo, College of Pharmacy, Toledo. (1941)
George L. Baker, Dean*
Bess G. Emch, Acting Dean
Western Reserve University, School of Pharmacy, Cleveland. (1902)
F. J. Bacon, Dean

Oklahoma

University of Oklahoma, School of Pharmacy, Norman. (1905)
David B. R. Johnson, Dean

Oregon

Oregon State College, School of Pharmacy, Corvallis. (1915)
George E. Crossen, Dean

Pennsylvania

Duquesne University, School of Pharmacy, Pittsburgh. (1927)
Hugh C. Muldoon, Dean
Philadelphia College of Pharmacy and Science, Philadelphia. (1900)
Ivor Griffith, Dean
Temple University, School of Pharmacy, Philadelphia. (1928)
H. Evert Kendig, Dean
University of Pittsburgh, Pittsburgh College of Pharmacy, Pittsburgh. (1900)
C. Leonard O'Connell, Dean

*On leave of absence.

Philippines

University of the Philippines, College of Pharmacy, Manila. (1917)
Mariano V. del Rosario, Dean

Puerto Rico

University of Puerto Rico, College of Pharmacy, Rio Piedras. (1926)
Luis Torres-Diaz, Dean

Rhode Island

Rhode Island College of Pharmacy and Allied Sciences, Providence. (1926)
W. Henry Rivard, Dean

South Carolina

Medical College of the State of South Carolina, Charleston. (1940)
William A. Prout, Director
University of South Carolina, School of Pharmacy, Columbia. (1928)
Emery T. Motley, Dean

South Dakota

South Dakota State College, Division of Pharmacy, Brookings. (1908)
Floyd J. LeBlanc, Dean

Tennessee

University of Tennessee, School of Pharmacy, Memphis. (1914)
Robert L. Crowe, Dean

Texas

University of Texas, College of Pharmacy, Austin. (1926)
William F. Gidley, Dean

Virginia

Medical College of Virginia, School of Pharmacy, Richmond. (1908)
Wortley F. Rudd, Dean

Washington

State College of Washington, School of Pharmacy, Pullman. (1912)
Pearl H. Dirstine, Dean
University of Washington, College of Pharmacy, Seattle. (1903)
Forest J. Goodrich, Dean

West Virginia

West Virginia University, College of Pharmacy, Morgantown. (1920)
J. Lester Hayman, Dean

Wisconsin

University of Wisconsin, School of Pharmacy, Madison. (1900)
Arthur H. Uhl, Director

MEETING OF A. PH. A. COUNCIL AND JOINT MEETINGS POSTPONED

In view of the revised regulations of the Office of Defense Transportation governing travel, the Council of the American Pharmaceutical Association has voted unanimously to postpone indefinitely the meeting of the Council originally scheduled to be held in Chicago in September. Prior to this action the Council contacted the officials of the American Association of Colleges of Pharmacy and the National Association of Boards of Pharmacy who agreed it would be unwise to attempt to hold the joint meeting of the three executive bodies of these Associations as previously scheduled.

Accordingly, the Council will continue to conduct the business of the American Pharmaceutical Association by correspondence as is provided for in its By-Laws until such time as the war situation has cleared up sufficiently to restore fairly normal travel conditions.

Due notice will be given of the date to be fixed for the next meeting of the Council, and in the meantime the Association's office is proceeding with the compilation of annual reports of officers and committees for publication in the Proceedings Number of the Journal.

All officers and committees have been requested to complete their reports as of July 31 and send them to the Secretary as promptly as possible.

July 26, 1945 — Robert P. Fischelis, Secretary

I have recently conferred with Dean Christensen about the meeting of the Executive Committee of the A. A. C. P. It is his opinion, after conferring with Fischelis and Costello, who in turn conferred with the O. D. T. that we should postpone our meeting. The O. D. T. informs us that during the next month or two, people who come from the west or east coast to a central meeting place may not be able to secure transportation home. Our present understanding is that the September meeting is cancelled and that we will hold a meeting as soon as possible. Chairman Christensen will send out a notice to the members of the Executive Committee at an early date.

August 2, 1945 — Glenn L. Jenkins, President

I have kept in constant touch with President Jenkins as developments occurred and it is our opinion that the A. A. C. P. should go along with the A. Ph. A. and N. A. B. P. Consequently, a meeting of the Executive Committee of this Association will be held if and when conditions make it possible and if and when the Executive Committees of the A. Ph. A. and N. A. B. P. decide to meet.

August 8, 1945 — B. V. Christensen, Chairman
Executive Committee

READ

"PRESIDENT JENKINS' REQUEST"
On Page Following "Contents" in This Issue